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CORPORATE FINANCE

2° YEAR BIEM / BIEF

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CORPORATE FINANCE

CHAPTER 1 - INTRODUCTION TO CORPORATE FINANCE

1.1 *Corporate Investment and Financing Decisions*

- In order to carry on a business, a corporation needs and endless variety of *real assets*
  - The corporation pays for these real assets by selling claims on them and on the future cash flows that they will produce

- *Financial Assets* ➔ Corporation promise to repay a loan to a bank with interest
  - A bank loan is not a security because it is held by a bank and is not traded in financial markets
  - A *bond* is both a financial asset and a *security* because it can be held and traded by investors in the financial markets

- The *Investment Decision* of a firm relates to the decision to purchase real assets, but also managing assets already in place and deciding when to shut down and dispose of those assets if they are no longer profitable
  - These decisions are usually referred to as **capital budgeting** or **capital expenditure** (**CAPEX**) decisions because most large corporations prepare an annual budget listing the major projects approved for investment
  - Investments involve the purchase of both tangible and intangible assets
  - Cash returns are not guaranteed and they can have different time horizons

- The *Financing Decision* of a firm involves selling securities and other financial assets, but also assessing whether the firm will be able in the future to meet its obligations to bondholders, banks, and stockholders that have contributed capital
  - If a firm borrows from *lenders*, the corporation promises to pay back the debt plus a fixed rate of interest
  - If a firm borrows from *shareholders*, it is using *equity financing.*
  - Shareholders, contrary to debtholders, are not guaranteed a fixed return, but they hold shares of stock and hence get a fraction of the future profits of the firm

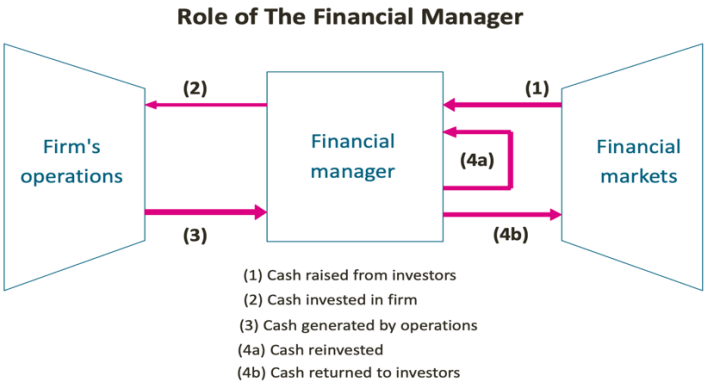
➔ The choice between debt and equity financing is called the **capital structure** decision, where capital refers to the firm's sources of long-term financing

- Corporation raise *equity financing* in 2 ways:
  - They can issue new shares of stock to shareholders who put up the cash in exchange for a fraction of the company's future profits
  - They can reinvest the cash flows generated by their existing assets in the firm

➔ If the corporation does not reinvest all of the cash flow generated, it can decide to hold cash for future investments or pay the cash back to shareholders through dividends or share repurchases (**payout decisions**)

- A **corporation** is a legal entity owned by its shareholders:
  - As a legal person, it can enter into contracts, carry on business, borrow and lend money, sue or be sued, and pay taxes.
  - Corporations are created under state law through *articles of incorporation* that set out the purpose of the business and how it is governed and operated
  - A corporation is owned by its shareholder, but it is *legally distinct* from them, indeed shareholders have **limited liability**, so they cannot be held personally responsible for the corporation's debts
  - If the shares of a corporation are not publicly traded, the company is *closely held*, otherwise if the shares are traded in public markets, they are *public companies*

➔ Corporations are also characterized by the **separation between ownership and control**
  - This gives corporations *permanence*, which means that the corporation survives even if management changes
  - It may cause *agency problems,* as managers may not act in the best interest of shareholders
  - Corporations are also subject to **double taxation**, on their profits and on the dividends they pay to shareholders



- In a corporation, financial managers raise cash from investors either in the form of debt or equity
  - Then, cash is invested in the firm's operations and used to purchase real assets
  - The cash that is generated from operations can be either be reinvested in the firm, or given back to shareholders in the form of dividends or share repurchases

1.2 *The Financial Goal of a Corporation*

- Since large corporations may have hundreds of thousands of shareholders, it is impossible that they can actively manage the firm
  - Therefore, they delegate the operation of the firm to professsional managers who work in order to *maximize the value of shareholders' investment in the firm*
  - Maximizing shareholders' wealth is a sensible gaol provided that financial markets are efficient
  - However, depending on the country we are in, CEOs may act in the best interests of shareholders or stakeholders

- Shareholders have three main aims:
  - Maximizing their current wealth
  - Transform their wealth into the most desirable time pattern of consumption either by borrowing to spend now or by investing to spend later
  - Manage the risk characteristics of that consumption plan

- Shareholders do not need financial managers to achieve their desired time pattern of consumption:
  - They can do it on their own, provided that they have access to competitive financial markets to choose the risk characteristic of their consumption plan, by investing in more or less risky assets

➔ The role of financial managers is to increase the wealth of shareholders by increasing the price of the shares of the company

- Assuming that financial managers act in the best interest of shareholders, corporations can increase value by investing in projects that earn more than the *opportunity cost of capital*
  - The minimum rate of return asked by shareholders is called the *hurdle rate* or *cost of capital* and is the opportunity cost of capital because it depends on the investment opportunities available to investors in the financial markets
  - As long as corporations invest in projects with higher rates of returns than its shareholders can earn for themselves in the stock market, shareholders will like the investments and the stock price will rise

- Usually, the higher the expected return of an investment, the higher the risk:
  - For this reason, the opportunity cost of capital depends on the risk of the proposed investment project

- In public corporations, the separation between ownership and control is necessary, but can also be dangerous
  - Conflicts between shareholders' and managers' obejective create *agency problems*
  - *Agency Costs* are incurred when managers do not attempt to maximize the firm value or shareholders incur in costs to monitor the managers and constrain their actions
  - An example of Agency Cost is when the senior management team, while travelling, books the most expensive hotel.

- Agency costs can be mitigated by:
  - Compensation plans, if they are not manipulated (e.g., "options backdating")
  - Board of directors, if the board members are independent
  - Auditors
  - Takeovers, if no anti-takeover provisions are in place in the articles of incorporation

CHAPTER 28 – FINANCIAL ANALYSIS

- Public companies have a variety of stakeholders who need to monitor the firm and to ensure that their interests are being served
  - Stakeholders rely on both *financial statements* and *financial markets* to get the necessary information about a firm
  - Public Companies in the US report to their shareholders *Quarterly* (through the model **10-Q**) and *Annually* (through the model **10-K**)

- In the Balance Sheet both assets and liabilities are listed in order of liquidity:
  - Current Assets → Fixed Assets
  - Current Liabilities → Long-term Debt → Shareholders' Equity

- The difference between *Current Assets* and *Current Liabilities* is known as *Net Current Assets* or *Net Working Capital* and it measures the company's potential reservoir of cash:

$$\boldsymbol{Net\ Working\ Capital} = Current\ Assets - Current\ Liabilities$$

$$\boldsymbol{Market\ Capitalization} = Number\ of\ Outstanding\ Shares \times\ Price\ per\ Share$$

$$\boldsymbol{EBIT} = Total\ Revenues - Costs - Depreciation$$

MEASURING PERFORMANCE

$$\boldsymbol{Market - to - book\ ratio} = \frac{market\ value\ of\ equity}{book\ value\ of\ equity}$$

- The market value of an assets reflects its future expected cash flows
  - Since the book value of an asset reflects its original cost, it might deviate significantly form market value if the earning power of the asset has increased or declined significantly since its acquisition
  - Given reasonably consistent accounting standards across firms, *Market-to-Book* ratios can be compared across similar firms for signs of under or over performance, or for signs of under or over valuation

- There are some issues with this approach:
  - An active share repurchase program of shares can reduce the book equity to zero
  - Market value of the company's shares reflects investors' expectations about future performance, but it is a noisy indicator of a company's current performance
  - It does not allow to understand the reasons for the performance
  - It is impossible to look up the market value of shares that are not publicly traded, nor the market value of divisions or plants that are parts of larger companies

→ Even if performance measures are low for a firm, the market-to-book ratio may be high because investors believe that the firm will be profitable in the future

PROFITABILITY MEASURES

$$\mathbf{1.}\ \boldsymbol{Return\ on\ Capital}\ (\boldsymbol{ROC}) = \frac{After\ tax\ Interest + Net\ Income}{Invested\ Capital}$$

- Measures the total profit that the firm has earned for its debt and equity holders, divided by the amount of money they have contributed
  - In the formula we subtract the tax-shield on debt interest to calculate the income that the company would have earned with all equity financing

$$\mathbf{2.}\ \boldsymbol{Return\ on\ Equity}\ (\boldsymbol{ROE}) = \frac{Net\ Income}{Equity}$$

- Measures the income to shareholders per dollar invested
  - In order to understand if the company has provided enough capital to its shareholders, wee need to compare the ROE with the company's cost of equity

$$\mathbf{3.}\ \boldsymbol{Return\ on\ Assets}\ (\boldsymbol{ROA}) = \frac{After\ tax\ Interest + Net\ Income}{Total\ Assets}$$

- Measures the income available to debt and equity investors per dollar of the firm's total assets
  - In the formula we subtract the tax-shield on interest payments in order to understand what the company would have earned if it was all equity-financed
  - This adjustment is useful to comapre companies with different capital structures

- The main issue with *book rates of return* are that:
  - They only show the current performance of a firm and are not affected by expectations
  - They are calculated using the assets net book values, regardless of their market values, which are not shown in the balance sheet

Decomposition of ROA

$$\boldsymbol{ROA} = \frac{After\ tax\ Interest + Net\ Income}{Total\ Assets} = \frac{Sales}{Assets} \times \frac{After\ tax\ Interest + Net\ Income}{Sales} =$$

$$= \boldsymbol{Asset\ Turnover} \times \boldsymbol{Operating\ Profit\ Margin}$$

- ROA can be decomposed as the product of Asset Turnover times the Operating Profit Margin:
  - Depending on the industry, these two components may differ
  - Food chains have higher Asset Turnover and lower Operating Profit Margin
  - Luxury Hotels have low Asset Turnover and high Operating Profit Margin

EFFICIENCY MEASURES

1. $\boldsymbol{Asset\ Turnover} = \dfrac{Sales}{Total\ Assets\ at\ start\ of\ year} = \dfrac{Sales}{Average\ Total\ Assets}$

- Measures how much sales volume is generated by each dollar of total assets, and therefore it measures how hard the firm's assets are working
  - If assets are turned over very slowly, it may be better to use the value at the start of the year
  - If assets are turned over fast, it may be preferable to use the average measure

2. $\boldsymbol{Inventory\ Turnover} = \dfrac{Cost\ of\ Goods\ Sold}{Inventory\ at\ start\ of\ year}$

3. $\boldsymbol{Inventory\ Period} = \dfrac{Inventory\ at\ start\ of\ year}{Daily\ Cost\ of\ Goods\ Sold}$

- Efficient firms do not tie up more capital that they need in raw materials and finished goods, but they hold a relatively small level of inventories that they turn over rapidly
  - The Inventory Period measures how many days of output are represented by inventories

4. $\boldsymbol{Receivables\ Turnover} = \dfrac{Sales}{Receivables\ at\ start\ of\ year}$

5. $\boldsymbol{Average\ Collection\ Period} = \dfrac{Receivables\ at\ start\ of\ year}{Average\ Daily\ Sales}$

- The Receivables Turnover ratio measures the firm sales as a proportiuon of its receivables:
  - If customer are quick to pay, unpaid bills will be a relatively small proportion of sales and the receivables turnover will be high
  - Indeed, a comapatively high ratio often indicates an efficient credit department that is quick to follow up on late payers
  - The faster the firm turns over its receivables, the shorter the collection period

LEVERAGE MEASURES

1. $\boldsymbol{Long\ Term\ Debt\ ratio} = \dfrac{Long\ term\ debt}{Long\ term\ debt + Equity}$

➔ Measures the proportion of long-term debt over the total long-term capital

2. $\boldsymbol{Long\ Term\ Debt/Equity\ ratio} = \dfrac{Long\ term\ debt}{Equity}$

- Some companies deliberately operate at very high debt levels:
  - Firms acquired in LBOs had average debt ratios of 90%

3. $\boldsymbol{Total\ Debt\ ratio} = \dfrac{Total\ Liabilities}{Total\ Assets}$

- This measure includes also short-term debt:
  - If a company is a regular short-term borrower, it may be preferable to widen the definition of debt to include all liabilities

4. $\boldsymbol{Times\ Interest\ Earned\ ratio} = \dfrac{EBIT}{Interest\ Payments}$

5. $\boldsymbol{Cash\ Coverage\ ratio} = \dfrac{EBIT + Depreciation}{Interest\ Payments}$

- This leverage ratio measures the extent to which interest obligations are covered by earnings
  - Banks indeed prefer to lend to firms with large interest coverage
  - If we add depreciation to the EBIT, we are able to understand if a firm has enough cash flows to cover its debt payments

LIQUIDITY MEASURES

- A firm has enough liquidity if it can lay its hands on enough cash to repay its debtors
  - Liquid assets can be converted into cash quickly and cheaply
  - Furthermore, managers like liquid assets because their book values are usually reliable

1. $\boldsymbol{Net\ Working\ Capital\ to\ Total\ Assets\ ratio} = \dfrac{Net\ Working\ Capital}{Total\ Assets}$

2. $\boldsymbol{Current\ Ratio} = \dfrac{Current\ Assets}{Current\ Liabilities}$

3. $\boldsymbol{Quick\ (Acid\ test)\ Ratio} = \dfrac{Cash + Marketable\ Securities + Receivables}{Current\ Liabilities}$

- Some current assets are more liquid than others:
  - If trouble comes, inventory may not sell at anything above fire-sale price

- Therefore, it is convenient to calculate the Current Ratio by removing inventories from Current Assets, as they are not necessarily liquid

4. $\boldsymbol{Cash\ Ratio} = \dfrac{Cash + Marketable\ Securities}{Current\ Liabilities}$

- The ratio measures how the firm's most liquid assets, namely Cash and Marketable Securities, compare to current liabilities
  - However, a low Cash Ratio may not matter if the firm can easily borrow on a short notice

CASE STUDY – UNIDENTIFIED INDUSTRIES

- Look at inventories and isolate firms that work in services from manufacturing firms
  - Firms in services should have no inventory
  - Furthermore, firms in services should have low Property, Plant, and Equipment

- Accounts Receivable is useful to separate retailers from other firms:
  - Low accounts receivable and short receivables collection period characterize retailers and B2C transactions
  - High accounts receivable and long receivable collection period characterize firms in B2B transactions

➔ In order to differentiate between B2B and B2C transactions, it is useful to use the Inventory days ratio

- The ratio PPE/Assets, also known as Capital Tangibility, is useful to understand if an industry is Capital Intensive or not
  - For instance, Airlines and Utility Industries will have a high PPE
  - On the other hand, industries like an Advertising Agency will have a low PPE

- A Bank will have very high accounts receivable in the form of loans, and high notes payable in the form of cash deposits

- The Airline firms will be characterized by no invenotry and a high asset tangibility

- If the Inventory Turnover ratio is large, it tells us that the firm changes the inventory frequently:
  - Firms that deal with perishable goods will tend to have a high inventory turnover ratio (e.g., Restaurants, Grocery Shops)

CHAPTER 2 – HOW TO CALCULATE PRESENT VALUES

- *Net Present Value* (**NPV**) equals the prsent value minus the required investment

$$NPV = -C0 + \frac{C1}{1+r}$$

➔ Since $PV = \sum_{t=1}^{T} \frac{C_t}{(1+r)^t}$, NPV will be equal to:

$$NPV = -C0 + \sum_{t=1}^{T} \frac{C_t}{(1+r)^t}$$

- The required rate of return is the return offered by a risk-equivalent invetsment in financial markets:
  - Indeed, one of the fundamental principles is that a safe dollar today is worth more than a safe dollar tomorrow

- We can justify investments by either two rules:
  - *Net present value rule* ➔ Accept investments with a positive NPV
  - *Rate of return rule* ➔ Accept investments with a rate of return in excess of their opportunity cost of capital

- *Perpetuities* are assets that offer a fixed income for each year, without expiration:

$$PV_{perpetuity} = \frac{C}{r}$$

➔ Keep in mind that the perpetuity formula tells us the present value of a regular stream of payments starting one year from now

- *Annuities* are assets that pay a fixed sum each year for a specified number of years:

$$PV_{annuity} = C \times \frac{1-(1+r)^{-t}}{r}$$

$$PV_{annuity\ due} = C \times \frac{1-(1+r)^{-t}}{r} \times \frac{1}{(1+r)}$$

➔ NB An annuity due has a stream of payments starting immediately

$$FV_{annuity} = C \times \frac{(1+r)^t - 1}{r}$$

- In some cases, perpetutites might be growing at a constant rate *g:*

$$PV_{growing\ perpetuities} = \frac{C_1}{r - g}$$

- We need to make a distinction between the *Annual Percentage Rate* (**APR**) and the *Effective Annual Rate* (**EAR**)
  - APR is calculated as the total annual payment divided by the number of payment in a year
  - If interest is paid once a year, APR and EAR are equal
  - However, if interest is paid more than once a year, because of compunding, EAR will be greater than APR

$$EAR = \left(1 + \frac{APR}{m}\right)^m - 1$$

- There is no limit to how frequently interest can be paid
  - An extreme situation is that one in which interest is paid continously and evenly throughout the year, hence we have an infinite m
  - \$1 invested today and continously compunded over a period of t years at a constant rate r, will grow to e^{rt}

CHAPTER 5 – NET PRESENT VALUE AND OTHER INVESTMENT CRITERIA

- The NPV rulew is base on 3 criteria:
  - NPV recognizes that a dollar today is worth more than a dollar tomorrow, because it can be invested and starts to earn interest right away
  - The NPV depends solely on the forecasted cash flows and on the opportunity cost of capital
  - Suppose that B has a negative cash flow, if the joint project (A+B) has a positive NPV, than A on its own would have a higher NPV

- The *Internal Rate of Return* is the discount rate that makes NPV=0

$$NPV = C_0 + \frac{C_1}{1 + IRR} + \frac{C_2}{(1 + IRR)^2} + \cdots + \frac{C_T}{(1 + IRR)^T} = 0$$

➔ The IRR is a profitability measure that depends solely on the amount and timing of the project cash flows

➔ On the other hand, the *opportunity cost of capital* is a standard of profitability established in the financial markets that we use to calculate how much is the project worth

- The Internal Rate of Return rule states that a firm should accept an investment project if the opportunity cost of capital is less than the internal rate of return
  - If IRR > r ➔ NPV > 0
  - If IRR = r ➔ NPV = 0
  - If IRR < r ➔ NPV < 0

Drawback of the IRR

- The rule will give the same answer as the net present value rule whenever the NPV of the project is a steadily declining function of the discount rate
  - For instance, if we borrow money, we want a low rate of return, therefore the NPV is an increasing function of the disocunt rate and, hence, NPV and IRR will give different answers

- A project may have different Internal Rate of Returns if there are changes in the sign of the cash flows:
  - Indeed, there will be as many IRRs as there are changes in the sign of cash flows

- It is also possible that a project has no internal rate of return:
  - In this case, it is useful to evaluate a project simply by using the present value

- Firms may need to choose between mutually exclusive projects if they have to choose bewteen several alternative ways of doing the same job

Project	CF Y0	CF Y1	IRR	NPV(10%)
A	-10000	20000	100%	+8,182
B	-20000	35000	75%	+11,818

➔ For instance, consider project A and B:

- A has the highest IRR because it allows to earn 100% of return
- B has the higher NPV, because it will make the investor $11,818 richer
- It is clear that B is better in this case, therefore using the IRR can be misleading

➢ The IRR rule tells us to accept a project if the IRR is greater than the opportunity cost:

- However, in case we have several opportunity costs, we would need to compute a complex weighted average of these rates to obtain a number comparable to the IRR
- However, in this cases the IRR usually survives because it is much more important to forecast accurately the project cash flows than it is to have more precise discounting rates

➢ When a company needs to choose between mutually exclusive projects, therefore, it may use the *Profitability Index*:

$$Profitability\ Index = \frac{NPV}{Investment}$$

- The project with the highest *Profitability index* is therefore the most convenient one

CHAPTER 6 – MAKING INVESTMENT DECISIONS WITH THE NPV RULE

Rules for applying the NPV rule

1. *Discount cash flows, not profits*

- The Net Present Value depends on the expected future cash flows, which is the difference between the cash received and the cash paid
    - For instance, when considering capital expenditures, state them when they occur, and not when they show up later in time as depreciation
    - To go from accounting icnome to cash flow, we need to add back depreciation and subtract capital expenditure

- When a firm invests in inventory, there is a cash outflow that will later be compensated when customers buy the products and pay for them
    - Working capital is the difference between a company's short term assets and liabilities
    - Most projects entail an investment in working capital, and therefore each period change in working capital should be recognized in the cash-flow forecast

- Some common mistakes with working capital are:
    - Forgetting about it completely
    - Forgetting that working capital is recovered at the end of the project
    - When Net Working Capital increases, it has a negative effect on cash flows
    - When Net Working Capital decreases, it has a positive impact on cash flows

2. *Discount incremental Cash Flows*

- The value of a project includes all the additional cash flows that follow from the project acceptance

- Including all the ***incidental effects*** means considering the impact of the project on the remainder of the firm's business
    - Indeed, a project may help the firm in its other activities and, therefore, even if it has a negative NPV, after taking into consideration the impact on the other activities it may be worth investing into

- Occasionally, the *incremental NPV* from investing in a losing project is strongly positive
    - On th other hand, it may not make sense investing in an already profitable project because it may have run out of opportunities

- Financial managers need to *discount all the incremental cash flows* coming from a project:
    - For instance, a jet engine manufacturer should not forecast the cash flows only coming from the sale of engines in the market, but also the cash flows from service and spare parts

- Do not forget the *opportunity cost of a resource*, since the cost of a resource may be relevant to the investment decision even if no cash changes hands:
    - If an airline needs to know whether to continue using a jet engine, or selling it into the market, its opportunity cost is the market price of the engine in the used engines market

- *Overhead Costs* are costs that need to be paid somehow, even if they are not directly related to any project:
    - When accountants assign a cost to a firm's project, they usually add a charge for overhead costs
    - The principle of *incremental cash flows* states that in investment appraisal we should include only the extra expenses that would reuslt from the project
    - A project may or may not generate extra overhead expenses, therefore we need to be careful to the allocation of this costs made by accountants

- *Salvage Value* usually represents a positive cash flow from the liquidation of the assets at the end of a project:
    - If the equipment is sold at a price higher than the book value, the firm must pay taxes on the gain
    - Some projects have significant shutdown costs, in which case the final cash flow may be negative

3. *Treat Inflation Consistently*

- Interests rates are usually quoted in *nominal rates rather than real rates*
    - Investors take inflation into account when they decide what is an acceptable rate of interest

- If the discount rate is in *nominal terms*, consistency requires that also *cash flows* must be in nominal terms
    - For instance, in countries where inflation is high and volatile the NPV is calculated by discounting real cash flows by the real discount rate

$$Real\ Discount\ Rate = \frac{1 + nominal\ discount\ rate}{1 + inflation\ rate} - 1$$

- In general, the basic rule is:
    - Discount nominal cash flows with the nominal discount rate
    - Discount real cash flows with the real discount rate

➔ Never mix the two!

4. *Separate Investment and Financing Decisions*

- If you finance part of a project using debt, you should *neither subtract* the debt proceeds from the required investment, *nor* recognize the interest and principal payments on the debt as cash outflows:
    - You should view the project as it was *totally equity financed*
    - Indeed, the procedure focuses exclusively on the project cash flows, not the cash flows asociated with alternative financing schemes

5. *Remember to Deduct Taxes*

- Taxes are an expense just like wages and raw materials:
    - For this reason, cash flows should be estimated on an after-tax basis
    - Some firms do not deduct tax payments, but they try to offset this mistake by discounting cash flows at a rate that is higher than the cost of capital
    - However, there is no reliabale formula for making such adjustment ot the discount rate

CHAPTER 3 – VALUING BONDS

- *Premium Bond*
  - Bond that sells at a price higher than face value
  - Investors that buy a bond at a premium face a capital loss over the life of the bond
  - Therefore, the yield to maturity is always less than the current yield

- *Discount Bond*
  - Bond that sells at a price lower than face value
  - Investors that buy a discount bond face a capital gain during the life of the bond
  - Therefore, the yield to maturity is always higher than the current yield

- Treasury Bonds, Notes, and Bills are traded in the *fixed-income market*
  - They are traded by a network of bond dealers, who quote prices at which they are prepared eithe rto buy or sell

- The *yield to maturity* is defined as the discount rate that explains the bond price:
  - When interest rates rise, the bond prices must fall because they are disocunted by a higher dicount rate

- The price of long term bonds is affected more by changing interest rates than the price of short term bonds
  - The Duration of a bond is the weighted average time to receive all the bond's cash flows and is expressed in years.

$$Dur = \frac{\sum_{t=1}^{n} \frac{C_t}{(1+i)^t} \times t}{\sum_{t=1}^{n} \frac{C_t}{(1+i)^t}}$$

  - The Duration of a bond is useful to measure how the bond price would change after a change in the interest rates

➔ *Modified Duration* measures the percentage change in the bond price for a 1-percentage point change in the interest rates:

$$Modified\ Duration = \%volatility = \frac{Duration}{1+i}$$

Term Structure of Interest Rates

- There are occasions in which the short-term interest rates differ from the long-term rates
  - In this case, it is worth dicounting each cash flow at a different rate
  - The relationship between short and long term interest rates is called the **term structure of interest rates**

- The *law of one price* states that the same commodity must sell at the same price in a well fucntioning market:
  - All the safe payments delivered on the same date must be discounted by the same spot rate

- The **spot rate** (r_t) can be intended as the rate of interest on a bond that makes a single payment at time t
  - Such bonds do actually exist and are known as **stripped bonds**

- The **forward rate** is the interest rate, fixed today, for some time in the future at a fixed time:
  - It can be computed from the yield curve itself or, assuming no arbitrage, with the following relationship:

$$(1 + s_{t+1})^{t+1} = (1 + s_t)^t (1 + f_{t,1})$$

$$Forward\ rate = f_{t,1} = \frac{(1 + s_{t+1})^{t+1}}{(1 + s_t)^t} - 1$$

- Two basic rules about discounting:
  - A dollar tomorrow cannot be worth less than a dollar the day after tomorrow
  - In well functioning markets, **arbitrage** opportunities are eliminated almost instantaneously by investors who try to take advantage of them

Explaining the Term Structure

- The **expectations theory** of the term structure states that in well-functioning bond markets investment in a series of short-maturity bonds must offer the same expected return as an investment in a single long-maturity bond
  - Only if this is the case, investors will be indifferent between holding short and long-maturity bonds
  - The theory implies that the only reason for an upward-sloping term structure is that investors expect short-term interest rates to rise
  - In the same way, if investors expect short-term rates to fall, the term structure will be declining➔ A downward sloping yield curve is a predictor of recessions

- Therefore, if short-term interest rates are significantly lower than long term rates, it is tempting to borrow short-term rather than long-term
  - The expecattions theory implies that such strategies will not work because investors expect long term rates to rise
  - When the term structure is upward sloping, an investor is likely to make money by borrowing short only if investors are *overestimating* future increases in interest rates

- However, the expectations theory is leaving out **risk**:
  - If one was confident about the future level of interest rates, he would simply choose the strategy with the highest return
  - However, if an investor was not sure about the future forecasts, he may opt for a less risky strategy even if it means giving up some of the returns

- For instance, *volatility* of long-term bonds does create an extra risk for investors who do not have such long-term obligation:

- Indeed, investors will be willing to hold longer term bond only if they were offered a higher return to compensate for the higher volatility
- In this case, the term structure will be *upward sloping* more often than not

➢ **Inflation** contributes to make riskier the long-term interest rates:
- Investors often decide to reduce the inflation risk by investing short-term and rolling over the the investment
- Indeed, investors do not know with certainty the future interetst rates, but they know that they will adapt to inflation
- If inflation increases, investors will be able to roll over the investment at a higher interest rate
- When inflation is uncertain and highly volatile, we will often see a steeply-upward sloping term structure

Real and Nominal Interest Rates

➢ The general price level can be tracked through several indexes:
- The *Consumer Price Index* (CPI) is the most common one, and measures what is the average price for a typical family's purchases

$$Real\ Cash\ Flow\ at\ date\ t = \frac{Nominal\ Cash\ Flow\ at\ date\ t}{(1 + inflation\ rate)^t}$$

➢ Most bonds promise a nominal interest rate, leaving the real interet rate uncertain:
- If the inflation rate turns out to be higher than expected, the real return on a certain bond will be lower
- *Indexed Bonds* like TIPS (Treasury Inflation-Protected Bonds) make payments linked to inflation

➢ The real interest rate depends on people's willingness to save (*supply of capital*) and opportunity for productive investment by governments and businesses (*demand for capital*)
- If investment opportunities improve, firms have more projects they can invest into, so they are willing to invest more than before at the current interest rate
  ➔ Therefore, the rate has to rise

- If investment opportunities deteriorate, there will be a fall in the real interest rate

➢ Short and medium-term interest rates are subject to the monetary policies of central banks:
- For example, sometimes central banks keep the nominal interest rates low depsite the high level of inflation
- This will cause the real rates to be negative
- However, nominal interest rates cannot be negative because investors can simply hold cash

- According to **Fisher's Theory**, a change in the *expected inflation rate* causes the same proportionate change in the *nominal interets rate*, but has no effect on the required real interest rate:

$$1 + r_{nominal} = (1 + r_{real})(1 + \pi)$$

Risk of Default

- When a company is struggling to meet payments with bondholders, it may default:
  - In the best-case scenario, investors can earn at most the bond payments
  - However, in the worst-case scenario, the firm will never pay the promised cash flows and investors may lose completely their investment
  - This kind of default risk applies in some way to every corporation

- Firms like Fitch, S&P's, or Moody's evaluate the safety of corporate bonds and assign a score according to their default risk
  - The *yield spread* is the difference between the yield on a bond and the risk-free rate
  - Hence, the yield spread is equal to the credit risk premium
  - If the risk premium increases, the issuer will have less resources available for financing projects

- *Sovereign Debt* is generally less risky than corporate debt, but we should not assume that it is always safe:
  - Indeed, countries can occasionally default on their debts (ex. Argentina)

➔ **Foreign currency debt**

- Most government defaults occur when a government borrows in dollars
- If investors worry that in some future crisis the government may run out of taxing capacity and may not be able to come up with enough dollars to repay the debt, the government will default

➔ **Own currency debt**

- If a government borrows in its own currency, default is less likely to happen
- Indeed, the government could always print more money to repay the debt
- Occasionally, governments prefer to default on their domestic debt rather than creating money to pay it off

CHAPTER 4 – THE VALUE OF COMMON STOCK

- Sales of shares to raise capital occur in the *primary market*
  - The greatest part of transactions, however, takes place in the *secondary market*
  - *Bid Prices* are prices at which investors are currently willing to buy, and these prices are in a descending order
  - *Ask Prices* are prices at which investors are currently willing to sell, and these prices are in an ascending order

Valuing Common Stock

- Public companies publish quarterly and annual balance sheets, which list the value of the company's assets and liabilities

- Book values, however, do not reflect the market value of the company assets and liabilities for different reasons
  - Assets and liabilities are recorded at historical cost that do not incorporate inflation
  - Book values usually exclude intangible assets
  - Accountants do not capture the *going-concern value*, which is the value that is created when a collection of assets is organized into a healthy operating business

➔ Nonetheless, book values are a useful benchmark to estimate the firm's value and may be useful to estimate the firm's *liquidation value*
  - The liquidation value is what investors get when a failed company is shut down and its assets are sold off

- **Comparables** are firms similar to the one analysts want to evaluate:
  - Analysts want to examine how much investors in the comparable firms are prepared to pay for a dollar of earning or book assets
  - Hence, in the **valuation by comparables** they see what the business would be worth at the comparables' price-earnings or price-to-book-value ratios
  - This kind of valuation method may be useful when we don't have stock prices

- The logic of the **discounted cash flow** suggests that:

$$\text{PV (share of stock)} = \text{PV (expected future dividends per share)}$$

  Therefore, the price of a stock today is:

$$P_0 = \frac{P_1 + DIV_1}{1 + r}$$

- **r** is called the **market capitalization rate** or **cost of equity capital** and is defined as the expected return on other securities with the same level of risk
  - Therefore, at each point in time, all securities in an equivalent risk class are priced to offer the same expected return
  - This is a condition of equilibrium in well-functioning capital markets

- The **DCF** or **dividend discount model** of stock prices allows to discount all the future dividends per share of a stock in order to get the current stock price
  - Dividends are discounted by the market capitalization rate
  - Notice that it is NOT correct to say that the value of a share is equal to the sum of the discounted earnings per share, because these are generally larger than dividends because part of the earnings are reinvested in the firm
  - The correct formulation is that share value is equal to the discounted stream of dividends per share

$$P_0 = \sum_{t=1}^{\infty} \frac{DIV_t}{(1+r)^t}$$

- However, companies may decide not to pay dividends for different reasons:
  - A growing company may maximize its value by investing all its earnings rather than paying out a dividend
  - Shareholders will be better off with this policy, provided that the investment offers a higher rate than the expected rate of return that shareholders would get by investing on their own
  - Shareholders' value is maximized if the firm can earn more than the opportunity cost of capital

➔ The dividend discount model is still logically correct for growth companies, but difficult to use when cash dividends are far away in the future
  - Furthermore, a firms may pay out cash not as dividends, but as share repurchases
  - If share repurchases are irregular and unpredictable, the dividend discount model can be difficult to deploy

- When the dividend discount model is not applicable, share price can be calculating by discounting the free cash flows of the company, finding the Present Value of the company as a whole, and then dividing the result by the Number of outstanding shares

Estimating the cost of equity capital

- Assuming that we are dealing with a stock that promises dividends with a constant growth rate, then the Present Value will be:

$$P_0 = \frac{DIV_1}{r-g}$$

➔ Therefore, the expected return on such stock can be expressed as the sum of the *dividend yield* and the *constant growth rate*:

$$r = \frac{DIV_1}{P_0} + g$$

- An alternative approach to estimating long-run growth starts with the **payout ratio**:

$$Payout\ Ratio = \frac{Div}{EPS}$$

$$Plowback\ Ratio = 1 - payout\ ratio = 1 - \frac{Div}{EPS}$$

➔ Hence, the dividend growth rate can be calculated as:

$$g = Plowback\ Ratio \times ROE = \left(1 - \frac{Div}{EPS}\right) \times \frac{Net\ Income}{Number\ of\ oustanding\ shares}$$

- If the dividend payout ratio is fixed over time, it means that earnings are growing at the same rate as dividends over time
- If ROE is fixed over time, then the earnings growth rate is equal to the book equity growth rate
- The rationale is that the more a firm invest in the firm, the higher the dividend growth rate will be

➢ However, we can say that any estimate of ***r*** for a single common stock is noisy and subject to error:
- The best way to estimate ***r*** is taking a sample of similar companies, calclulating ***r*** for each one of them, and taking an average

➢ The simple constant growth DCF formula may not be so indicative of the present value of a company if the firm has high current rates of growth
- Therefore, it may be useful to use a ***two-stage DCF valuation model*** for fast growing firms
- Furthermore, sometimes growth is high in the short run not because the firm is unusually profitbale, but because it has exited from a period of low profitability

➢ Warnings with the DCF formula:
- It is almost always wortwhile to lay out a spreadsheet to ensure that your dividend projections are consistent with the company's earnings and required investments
- Be careful about using DCF valuation formulas to test whether the market is correct in its assessment of a stock's value, because if your estimate is different from the stock price, it is probably because of poor dividend forecast

Link between Stock Price and Earnings per Share

➢ Investors distinguish between *Growth Stocks* and *Income Stocks*:
- *Growth Stocks* are usually bought with the expectation of capital gains
- *Income Stocks* are primarly bought for the purpose of earing cash dividends

➢ Assuming that a firm does not grow at all, it does not plow back any earnigns and simply produces a constant stream of dividends, its stock would resemple a perpetuity
- Therefore, the expected return would be equal to the yearly dividend divided by the share price

- Since all the earnigns are paid out as dividends, the expected return is also equal to the earnings per share divided by the share price

$$Expected\ Return = Dividend\ Yield = Earnings/Price\ ratio = \frac{DIV_1}{P_0} = \frac{EPS_1}{P_0}$$

➢ Assuming that we are dealing with a Growth Firm, its expected return can be equal to the earnigns-price ratio

- The key is whether earnings are reinvested to provide a return equal to the market capitalization rate
- Hence, in this situation we can think of the stock price as the capitalized value of average earnigns under a no-growth policy, plus the **net present value of growth opportunities** (**PVGO**):

$$P_0 = \frac{EPS_1}{r} + PVGO$$

$$= \text{present value of stream of earnings}$$
$$+ \text{present value of growth opportunities}$$

➔ Therefore, the Earnings-Price ratio will be equal to:

$$\frac{EPS}{P_0} = r\left(1 - \frac{PVGO}{P_0}\right)$$

- If PVGO is positive, the ratio will underestimate r
- If PVGO is negative, the ratio will overestimate r, even though this situation is unlikely since firms will rarely take projects with a negative NPV

Valuing a Business by Discounted Cash Flow

➢ **Free Cash Flow** is the amount of cash that a firm can pay out to investors after paying for all investments necessary for growth

- FCFs can be negative for rapidly growing firms

➢ The valuation of a business is usually computed as the discounted value of the free cash flows out to a valuation horizon, plus the value of the business at the horizon, also discounted back at the present value:

$$PV = \frac{FCF_1}{1+r} + \frac{FCF_2}{(1+r)^2} + \cdots + \frac{FCF_H}{(1+r)^H} + \frac{PV_H}{(1+r)^H}$$

- Valuation horizons are usually chosen arbitrarily

CHAPTER 7 – INTRODUCTION TO RISK AND RETURN

- Treasury Bills is the safest kind of investment one can make since they have no default risk and short maturity, which does not expose them to price fluctuations
  - Long-term government bonds are subject to price fluctuations if interest rates change
  - Stocks are exposed to all the ups and downs of the issuing company

➔ For stocks, average returns taken over short periods of time are meaningless since they fluctuate widely:
  - The only way to gain insights from historical rates of return is to look at a very long period
  - In this case, the return of stocks approximate a Normal Distribution

- Notice that if the *cost of capital* is estimated from historical returns or risk premia, the **arithmetic averages** must be used, not the compound annual rates of return
- Historical evidence can be used in order to evaluate today's cost of capital:
  - Assume there is an investment project with a risk equal to the S&P 500
  - In order to discount the project's forecasted cash flows, you should use the currently expected rate of return on the market portfolio ($\boldsymbol{r_m}$), which is the rate of return you are foregoing by investing in the project
  - Since $\boldsymbol{r_m}$ is not likely to be stable over time, we cannot assume that it is equal to the past rates of return, that will repeat themselves in the future

$$\boldsymbol{r_m = r_f + normal\ risk\ premium}$$

➔ Since $\boldsymbol{r_f}$ varies over time, it is sensible to calculate $\boldsymbol{r_m}$ by summing the current risk-free rate to the average historic risk-premium
  - The crucial assumption to do so is that there is a normal, stable risk premium on the market portfolio, so that the future risk premium can be measured by the average past risk premium

Diversification and Portfolio Risk

$$Variance\ (\widetilde{r_m}) = E(\widetilde{r_m} - r_m)^2$$

- The variance of the market return is the expected squared deviation from the expected return
  - It is used in order to measure the spread of all the possible outcomes of an investment
  - Variance and Standard Deviation are therefore natural indexes of risk

- In order to measure the variability of a portfolio, financial analysts start by observing the past since it is reasonable to assume that portfolios with histories of high variability will have the least predictable future performance
  - However, there is no reason to suppose that the market's variability should stay always the same

- We can calculate our measures of variability equally well for individual securities and portfolios of securities:
    - However, if we take a portfolio of different stocks, its variability will not be equal to the average variability of its components
    - Indeed, *diversification reduces variability*

➔ For investors, even a little diversification can provide a substantial reduction in volatility

- Diversification can cut variability of returns significantly, even with a few stocks in portfolio:
    - Notice that improvements become smaller as the number of securities in the portfolio increases
    - Diversification works because prices of different stocks do not move exactly together, but stock price changes are less than perfectly correlated

➔ For instance, a decline in the price of a stock can be offset by a rise in the price of another

- **Specific Risk** is the risk that potentially can be eliminated through diversification
    - It stems from the fact that many of the perils that surround an individual company are peculiar to that company and perhaps its immediate competitors
    - It can be called also *unique, diversifiable*, or *idyosincratic* risk

- **Market Risk** is the risk that cannot be avoided through diversification
    - It stems from the fact that there are other economywide perils that threaten the business
    - This is why stocks have a tendency to move together and investors are exposed to market uncertainties, no matter how many stock they hold

➔ Therefore, we can say that for a reasonably well-diversified portfolio, only market risk matters

Calculating Portfolio Risk

- The *expected return* on a portfolio is simply the weighet average of the expected returns on the individual stocks, and the proportion of those stocks in the whole portfolio
    - The weights are the proportion of the portfolio invested in a certain stock
    - In the case of short-selling, the weights are negative because short-selling is similar to borrowing

- The *standard deviation* of a portfolio with two stocks is NOT equal to the weighted average of the deviations of the individual stocks:
    - This would only be the case if the prices of the two stocks were perfectly positively correlated correlated
    - In all other cases, diversification reduces the risk below this figure
    - If two assets were hypothetically perfectly negative correlated, there would be a portfolio startegy that could completely eliminate risk

$$Portfolio\ Variance = x_1^2\sigma_1^2 + x_2^2\sigma_2^2 + 2x_1x_2\rho_{1,2}\sigma_1\sigma_2$$

- When a portfolio is well diversified, the number of covariances is larger than the number of variances among the securities:
  - Hence, the variability of a well diversified portfolio reflects mainly the covariances
  - Suppose we are dealing with a portfolio in which equal investments are made in *N* stocks, with a proportion *1/N* in each stock, then:

$$Portfolio\ variance = \frac{1}{N} \times (Average\ Variance) + (1 - \frac{1}{N}) \times (Average\ Covariance)$$

➔ As N increases, the portfolio variance steadily approaches the Average Covariance
  - If the average covariance was zero, it would be possible to eliminate all risk by holding a sufficient number of securities
  - However, most of the stocks are tied together in a web of *positive covariances* that limit diversification

- Smart investors are able to eliminate Specific Risk by buying indexed funds, which represent almost the entire market
  - If an investor wants to buy the market as a passive investor, it makes sense to be an *indexes*
  - If an investor wants to be an active investors, he should start with a widely diversified portfolio, and then concentrate on a few stock as possible additions
  - Sometimes, investors may decide to give up diversification to invest more in specific stocks they are fond about

How individual securities affect portfolio risk

➔ **The risk of a well diversified portfolio depends on the market risk of the securities included in the portfolio**

- The ***beta*** of a security is the *sensitivity* of an individual security to market risk
  - Stocks with betas greater than 1 tend to amplify the overall movements of the market
  - Stock with betas between 0 and 1 tend to move in the same direction of the market, but not as far

➔ Since the market is the portfolio of all stocks, the average stock has a beta of 1

- It is important to notice that stocks with highest volatility also have high betas, but this is not always the case

- In a portfolio context, a security's risk is measured through its beta

- When the number of securities in a portfolio increases, diversification reduces risk until all the specific risk is eliminated and only the bedrock of market risk remains
- The bedrock depends on the average beta of the securities held in the portfolio

➔ The risk of a well-diversified portfolio is proportional to the portfolio beta, which equals the average beta of the securities included in the portfolio

$$\beta_i = \frac{Cov(i, market)}{\sigma^2_{market}}$$

- The ratio measures a stock's contribution to portfolio risk
- σ^2_{market} is calculated by averaging the variances of market returns
- $Cov(i, market)$ is calculate by averaging the product of the two deviations

Diversification and Value Added

➢ Investors can build diversified portfolios very easily by buying and selling securities in the market:
  - Therefore, they would only be willing to pay a value added for the diversification of a firm if they were not able to hold a large number of securities
  - If investors were willing to pay a premium for diversified firms, then:

$$\text{PV (AB)} > \text{PV(A)} + \text{PV(B)}$$

➔ Hence, *value additivity* would not apply because investors would be willing to pay a premium for the firm diversification

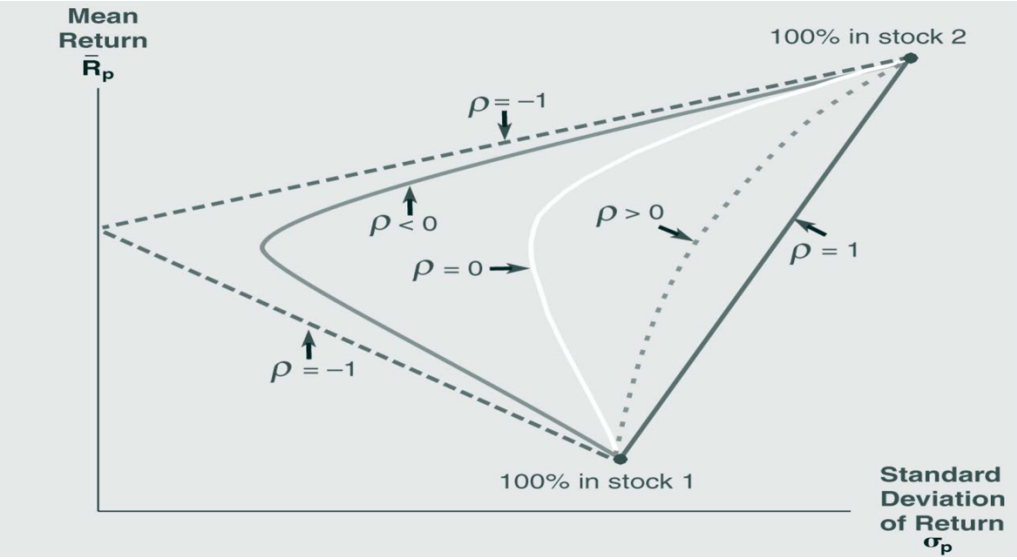
- However, *value additivity* actually applies to the value of a firm since investors can diversify on their own and are not willing to pay any extra amount for diversified firms
- Therefore, the value of a diversified firm is simply the sum of the present values of the different parts of the firm itself

$$\text{PV (AB)} = \text{PV(A)} + \text{PV(B)}$$

CHAPTER 8 – PORTFOLIO THEORY AND CAPITAL ASSET PRICING MODEL

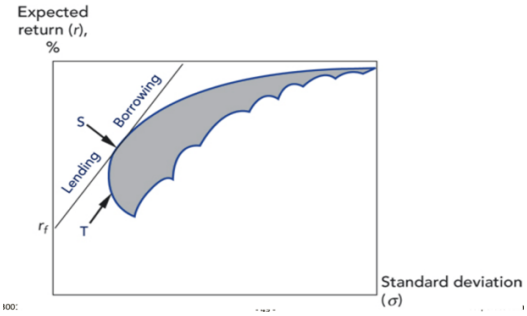
Markowitz and the birth of portfolio theory

- Markowitz showed how investors can build portfolios and reduce their standard deviation by including assets that do not move exactly together
    - When measured over a short interval, the oast rates of return on any stock conform fairly closely to a Normal Distribution, which is defined by two numbers: Expected Value and Variance
    - Therefore, if returns are normally distributed, expected return and standard deviation are the two only measures an investor need to consider



- The figure above shows the expected return and risk an investor can achieve by combinations of two stocks:
    - If an investor wants to get rich quickly, he should put everything in the stock with the highest expected return, which, however, entails the highest risk
    - The dotted line shows the case in which two stocks are perfectly negatively correlated, and therefore it is possible to build a zero-risk portfolio
    - The straight line shows the case in which two stock are perfectly positively correlated, and hence no diversification is possible

- However, investors are not restricted to invest in just two stocks, but they can invest in a variety of securities
    - Given a set of stocks, investors can use past data to estimate the risk on each stock and the correlation between the returns on each pair of stocks
    - Therefore, by holding different proportions of a number of securities, it is possible to obtain a wider selection of risk and return



- Investors want to move up and left on the curve above, in order to maximize expected returns and reduce volatility
  - As they do so, they will end up obtaining an efficient portoflio, which lies on the efficient frontier
  - The efficent frontier gives the best expected return for a portfolio for a given standard deviation

Assume that an investor can either borrow or lend money at the risk-free rate r_f

- If he invests in Treasury Bills and invests the rest of capital in a common stock portfolio, he can obtain a combination of expected return and risk along the straight line joining r_f and S
- Since borrowing is merely negative lending, an investor can extend the range of possibilities to the right of S by borrowing fund at the risk-free rate and invest them in the risky stock portfolio S

➔ Investors can get the highest expected return by a mixture of portfolio S, which is the best efficient portfolio, and borrowing or lending

- The efficient portfolio at the tangency point is better than all others:
  - It is the protfolio that offers the highest Sharpe Ratio, which is the highest ratio of risk premium to standard deviation

$$Sharpe\ Ratio = \frac{r - r_f}{\sigma}$$

  - Investors track the Sharpe Ratio to measure the risk-adjusted performance of investment managers

- We can split the investor's job in two parts:
  - Select the best portfolio of common stocks
  - Blend this portfolio with borrowing or lending to match the investor's willingness to bear risk

➔ Therefore, each investors should put money into just two benchmark investments, the risky portfolio, and the risk-free loan

- In the end, if an investor does not have better information than its rivals, there is no reason why he should hold a portfolio of common stock different from anybody else:
  - He might just hold the market as portfolio by building a market indexed portfolio

The relationship between risk and return

- The *market risk premium* is the difference between the return on the market and the risk-free interest rate
  - Since 1900, the market risk premium $(r_m - r_f)$ has been equal to 7.7%

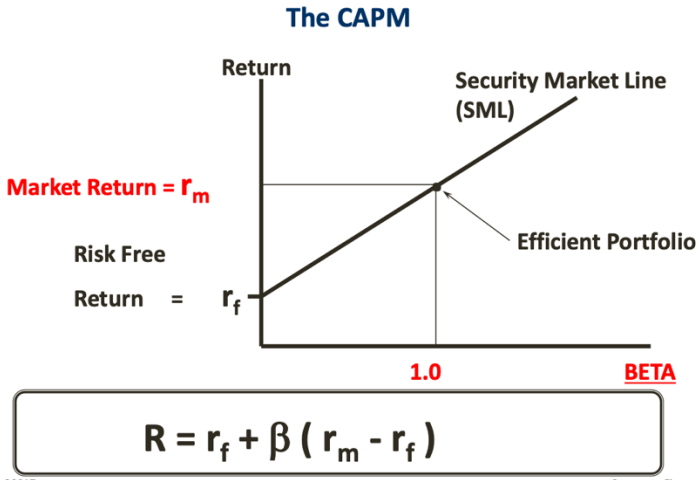
- We have two benchmarks for an investment expected risk-premium
  - Treasury Bills have a beta of 0 and a risk premium of 0
  - On the other hand, the market portfolio has a beta of 1 and a risk premium equal to $(r_m - r_f)$

➔ The **Capital Asset Pricing Model** allows us to have a benchmark for investments whose beta is different from 0 or 1

- The **CAPM** states that, in a competitive market, the expected risk premium varies in direct proportion to beta:
  - This means that all investments must plot along the upward-sloping line known as **security market line**
  - The relationship is as follows:

$$\text{Expected risk premium} = \text{beta} \times \text{Expected risk premium on market}$$

$$r - r_f = \beta(r_m - r_f)$$



- However, choosing a discount rate *r* for a firm is seldom easy
  - Firstly, you must learn how to adjust it to remove the extra risk caused by company borrowing
  - Furthermore, the difference between short- and long-term interest rates must be considered
  - Indeed, it is possible that investors were content with the prospect of a smaller return in the short run, but they certainly required higher long-term returns
  - If that is the case, a cost of capital based on short-term rates may be inappropriate for long-term capital investments

- Therefore, we can sum-up the CAPM:
  - Investors prefer high returns and low standard deviations and choose the most efficient portfolio
  - If investor can lend or borrow at the risk-free rate, the market portfolio is the best portfolio of all efficient portfolios, since it offers the highest Sharpe Ratio
  - Investors will only differ in the percentage invested in the market portfolio and the risk-free asset
  - The relevant measure of an individual security is not its own risk, but its countribution to the risk of a portfolio, which depends on the stock sensitivity to changes in the value of the portfolio
  - The sensitivity is measured by beta and is equal to the marginal contribution of a stock to portfolio risk

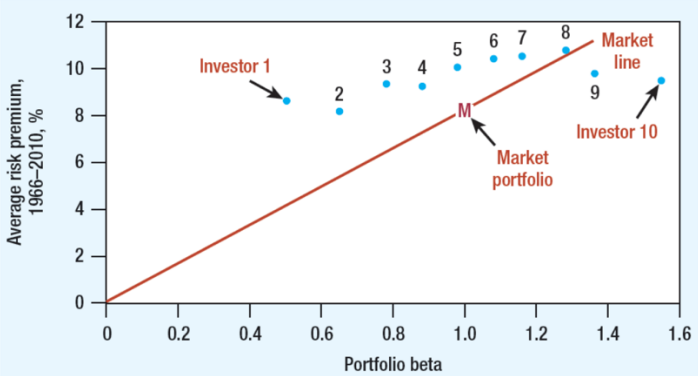
Vailidity of the CAPM

- It is straightforward to say that investors require some extra return for taking on risk:
  - This is the reason why common stock have given on average higher return than US Treasury Bills

- Furthermore, investors appear to be concerned mainly with the risk they cannot diversify
  - However, we observe that mergers undertaken just to spread risk do not increase stock prices, and investment companies are no more highly valued than the stock they hold

- The CAPM predicts that the risk premium should increase in proportion to beta, so that the returns of each portfolio should lie on the upward-sloping security market line

Empirical tests of the CAPM (1966-2010)



- Critics of the CAPM have pointed out that, in recent years, the slope of the CAPM has been particularly flat:
  - The response of defenders of the models is that the CAPM has to do with *expected returns*, whereas we ca only observe the actual returns
  - Actual stock returns reflect both expectations, but also embody a lot of noise, which makes it impossible to judge whether the model holds better in one period than in another

- The CAPM has also been criticized because returns have not risen consistently with beta, but with other measures:
    - Value Stocks are defined as those with high ratios of book value to market value
    - Growth Stocks are defined as those with low ratios of book value to market value

➔ Evidence shows that, in the long-run, value stocks have provided higher return than growth stocks
    - This finding does not fit well the model, which predicts that beta is the only reason why expected return may differ
    - However, it seems like investors saw risks in small-cap stocks and value stocks that were not captured by beta

Assumption behind the CAPM

1) *Investments in T-Bills are risk-free*
    - However, notice that bills do not guarantee a real return because there is uncertainty about inflatio

2) *Investors can borrow and lend at the same risk-free rate*
    - However, notice that generally borrowing rates are higher than lending rates

3) *All assets are marketable*
    - However, notice that not every asset is marketable
    - For instance, human capital cannot be bought and sold

CHAPTER 13 – THE EFFICIENT MARKET HYPOTHESIS

- Economists identify 3 levels of market efficiency:

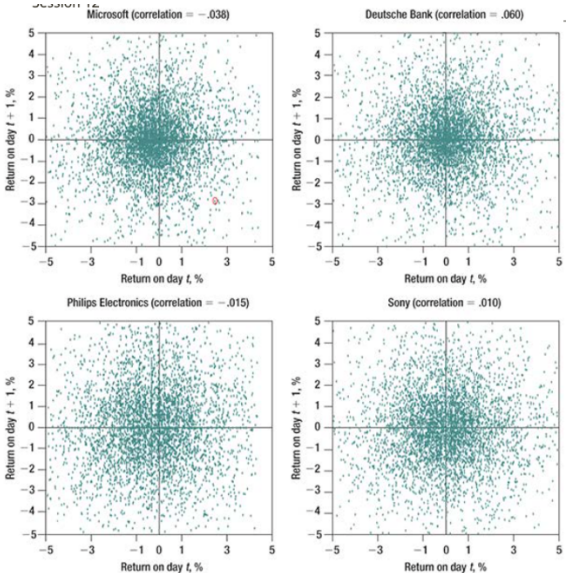
1. ***Weak Efficiency***
    - If the weak-form efficiency holds, prices follow a *random walk*
    - Therefore, prices must reflect all information contained in past prices

2. ***Semistrong Efficiency***
    - The semistrong efficiency holds if markets reflect instantaneously all publicly available information
    - Prices reflect not only past information, but also new information released by the firm

3. ***Strong Efficiency***
    - The Strong Efficiency states that prices reflect all the infromation that can be acquired by painstaking analysis of companies and the economy
    - In such market, we would observe lucky and unlucky investors, but no superior investor who can consistently beat the market

Weak Efficiency - Random Walks

- In the 1950s, statistician Maurice Kendall discovered that prices of stocks and commodities seem to follow a random walk
    - This is so because successive changes in value are independent
    - Indeed, empirical evidence on different stocks shows that return on day t+1 are completely independent from returns on day t



    - If we calculate the **autocorrelation coefficient**, which is the correlation coefficient between successive observations on the same stock, we will se that it is close to zero. This means that there are no day-to-day patterns

- If past price changes could be used to predict future changes, investors could make easy profits
    - However, in competitive markets, all investors will try to take advantage of any information in past prices, and prices will adjust immediately until the superior profits from studying price movements disappear
    - As a result, all the information in past prices will be reflected in today's stock price, not tomorrow's

➔ Therefore, patterns in price will no longer exist, and price changes in one period will be independent of changes in the next (*whichs means that stock prices will follow a random walk*)

- Statistical evidence suggests that prices follow a pattern *close to a random walk*
    - We say *close to a random walk* because every economic theory has exceptions, and indeed we can identify some patterns in stock returns

➔ Indeed, we have *statistical evidence* for **momentum**:
    - Stocks that have dalivered high returns in the past few weeks or months tend to deliver superior returns in the future
    - Monentum does not generate easy money for investors, but is just a statistical tendency
    - Furthermore, pursuit of momentum profits sacrifices diversification and increases risk

Semistrong Efficiency

- Semistrong efficiency means that prices respond to relevant news quickly and completely
    - The theory has been tested by examining how stock prices respond to public releases of information
    - However, the quick response of the stock price to a new public information does not prove that the new price is right and completely incorporates the new information

- **Event studies methodologies** is a more thorough strategy to test the semistrong efficiency hypothesis
    - The methodology is based on the examination of *abnormal returns* on samples of stocks that encountered the same type of news releases
- The general approach starts with a proxy for what the stock price would have been in the absence of the event
    - The **abnormal return** due to the event is estimated as the difference between the stock's actual return and this benchmark
- The *benchmark return* can be estimated through several methodologies
    - A simple methodology measures the stock's abnormal return as its return minus that of a broad market index
    - Another approach measures the expected return using an asset pricing model

- In order to estimate abnormal returns, we can use the CAPM, which states that at any point in time, t, the expected return on a stock is simply given by:

$$R_t = Rf + \beta(R_{tM} - Rf)$$

  - The abnormal return (AR_t) is simply what we observe (r_t), relative to what we expected (R_t):

$$AR_t = r_t - R_t = r_t - [Rf + \beta(R_{tM} - Rf)]$$

  - Here, we can assume that the return of the risk free rate is zero, which is a reasonable assumption for event studies, where we look at narrow time windows. Hence, the abnormal return under the CAPM is:

$$AR_t = r_t - \beta(R_{tM})$$

- We measure the impact of an event by estimating the abnormal return on a stock at the moment the information about the event becomes known to the market
  - For instance, in a study of the impact of merger attempts on the stock prices of target firms, the announcement date is the date on which the public is informed that a merger is to be attempted

➔ Often, we compute **cumulative abnormal return**, which is simply the sum of all abnormal returns over the time period of interest
  - The CAR captures the total firm-specific stock movement for an entire period when the market mught be responding to new information

Strong Market Efficiency

- Tests on the strong form of the market-efficiency examined whether professional investors can consistently beat the market
  - Evidence suggests that actively managed funds do not persistently outperform the market and, if they do, they fail to recoup the cost of management

- It seems that top perfomring managers in one period have about an average chance of falling on their faces in the next period
  - The evidence on the efficient markets hypothesis has convinced many professionals and individual investors to give up pursuit of superior performance and simply buy the index
  - Buying the index maximizes diversification and cut costs to the bone

- However, if all investors held indexed funds, then nobody will be collecting information, and prices will not respond to new information when it arrives
  - Therefore, an efficient markets needs some smart investors who gather information and attempt to profit from it
  - In order to provide incentives to gather costly information, prices cannot reflect *all available information*, but there must be some profit available to recoup costs

CHAPTER 9 – RISK AND COST OF CAPITAL

Company and Project Costs of Capital

- The **company cost of capital** is defined as the expected return on a portfolio of all company's oustanding debt and equity securities
  - Therefore, it can be defined as the opportunity cost of capital for an investment in all of the firm's assets
  - For this reason, it can be considered the appropriate discount rate for the firm's average-risk projects
  - If the firm has no debt outstanding, then the company cost of capital is just the expected return on the firm's stock

➔ Notice that the Cost of Capital is **not the appropriate discount rate** if the new projects are more or less risky than the firm's existing business
  - Indeed, each project should be evaluated at its own opportunity cost of capital
  - Hence, we can say that the Opportunity Cost of Capital depends on the use to which that capital is put

- Assume that we measure the risk of a project by its beta:
  - Then, a firm should accept any project lying *above* the upward-sloping security market line that links expected return to risk
  - This is the same as saying that, the higher the risk,the higher the epxected return of a project must be
  - Notice that this **does not imply** that a firm must accept any project regardless of its risk, as long as it offers a higher return than the company's cost of capital
  - Intuitively, a firm should not require the same rate of return from a very safe project as from a very risky one

- Even if we said that the true cost of capital depends on project risk and not on the company undertaking the project, many firms try to estimate their cost of capital for different reasons:

1) Firstly, many projects can be treated as average-risk projects which have the same risk of the company's other assets
   - Therefore, the right discount rate for these projects is the firm's cost of capital

2) Secondly, the company cost of capital is a useful starting point for setting discount rates for unusually risky or safe projects
   - Indeed, it is easier to add to, or subtract from, the company cost of capital than to estimate each project's cost of capital from scratch
   - Therefore, the company cost of capital is used as a company-wide benchmark that business people can adjust according to the riskiness of new ventures

- The ompany cost of capital can be estimated as a blend of the *cost of debt* and the *cost of equity*
  - The *cost of debt* is the interest rate on the firm's oustanding debt
  - The *cost of equity* is the expected rate of return demanded by investor's in the firm's common stock

$$\text{WACC} = r_D \frac{D}{A} + r_E \frac{E}{A}$$

➔ The blended measure of the company cost of capital is called the **weighted-average cost of capital** (**WACC**)

- Since interest rates on oustanding debt are tax-deductible, firms also usually calculate the after-tax weighted-average cost of capital

$$\text{After Tax WACC} = (1 - T_C) \times r_D \times \frac{D}{A} + r_E \times \frac{E}{A}$$

Measuring the Cost of Equity

- To measure the WACC, a firm needs to estimate the cost of equity
  - Usually, this is done using the CAPM, which states that:

$$\text{Expected Stock Return} = r_f + \beta(r_m - r_f)$$

- In order to estimate the future beta of a company's stock, we need to rely on historical evidence
  - This can be done by running a regression of the market returns and the firms returns
  - The slope of the line that best fits the data is the beta of the firm

- However, notice that if beta is measured over different periods, it is not constant for the same firms or industries:
  - Furthermore, only a portion of the total risk of a stock comes from movements in the market
  - The rest of the risk is diversifiable risk
  - The portion of total variance of the model that can be explained by market movements is given by the index R^2(R-squared), which tells us what percentage of observations is explained by the linear regression model

- Since returns can be noisy and oscure the beta of a firm, statisticians calculate the standard error of the estimated beta and set up a confidence interval of the estimated value to show the extent of possible mismeasurements
  - Nevertheless, there is always a large margin of error when estimating the betas of individual stock
  - Therefore, financial managers usually turn to industry betas to have a more accurate index

- Since the CAPM is a short-term model, it works period by period and calls for a short-term interest rate:
  - However, a three-months risk-free rate certainly cannot be used to estimate the right dicount rate for cash flows far away in the future

- This problem can be solved in 2 different ways:

1) The first way is to use a long-term risk-free rate in the CAPM formula
   - If this short-cut is used, then the market risk-premium must be restated as the average difference between market returns and returns on *long-term Treasuries*

2) The second way retains the usual definition of the market risk premium as the difference between market returns and returns on *short-term Treasury Bill rates*
   - Over the past century, the risk-premim of holding long-term bonds rather tha bills has averaged 1.5%
   - Hence, to ge a reasonable estimate of the expected long-term return from investing in short-term Treasury Bills, we need to subtract 1.5% from the current yield on long-term bonds

$$\text{Expected long term return from bills} = \text{Yield on long term bonds} - 1.5\%$$

- We can notice that the cost of debt is always less than the cost of equity
  - For this reason the WACC formula can be dangerous, because it suggests that expensive equity can be subsituted with cheap debt
  - However, as the proportion of total debt increases, the costs of the remaining equity also increases, thus offsetting the apparent advantage of more cheap debt

- The **Asset Beta** is a weighted-average between beta of debt and beta of equity:

$$\beta_{\text{Assets}} = \beta_{\text{Debt}} \frac{D}{A} + \beta_{\text{Equity}} \frac{E}{A}$$

  - Recall that the WACC gives an estimate of the average rate of return of a company's project:

$$\text{WACC} = r_{\text{assets}} = r_D \frac{D}{A} + r_E \frac{E}{A}$$

  - Therefore, the average rate of return on a firm's assets can be estimated also as:

$$r_{\text{assets}} = r_f + \beta_{\text{Assets}}(r_m - r_f)$$

➔ However, keep in mind that the asset beta is only an estimate of the average risk, but is not a precise measure for investments that are not average risk

Analyzing Project Risk

- When a company wants to set a cost of capital for one particular line of business, it typically looks at *pure plays* in the line of business:
  - *Pure Plays* are firms that specialize in one activit
  - On the other hand, company costs of capital for conglomerates are useless because they diversify in unrelated industries, so they have to consider industry-specific costs of capital
  - Therefore, conglomerates usually look at pure play in the relevant industries

- When good comparables are not available or are not a good match to a particular project, then financial managers must exercise their own judgement by:
  - Thinking about the determinants of Asset Betas
  - Avoiding being fooled by diversifiable risk
  - Avoiding fudge factors

Determinants of Asset Betas

1) *Cyclicality*

- When measuring the risk of a firm, what really counts is the strength of the relationship between the firm's earnings and the aggregate earnings on all real assets
  - This relationship can be measured either by using the *earnings beta* or the *cash-flow beta*
  - Firms with high earnings or cash-flow betas are more likely to have higher asset betas

➔ This means that **cyclical firms** tend to be *high-beta firms*, and therefore and investor should require a higher rate of return from investments whose performance is strongly tied to the performance of the economy

2) *Operating Leverage*

- A production facility with high fixed costs relative to variable costs is said to have a **high operating leverage**
  - The higher the operating leverage, the higher the asset beta will be

- The firm's cash flow can be written as:

$$\text{Cash Flow} = \text{Revenue} - \text{Fixed Cost} - \text{Variable Cost}$$

  - In the same way, we can break down the asset's present value:

$$\text{PV(Asset)} = \text{PV(Revenue)} - \text{PV(Fixed Cost)} - \text{PV(Variable Cost)}$$

    Or equivalently,

$$\text{PV(Revenue)} = \text{PV(Fixed Cost)} + \text{PV(Variable Cost)} + \text{PV(Asset)}$$

  - Therefore, the beta of PV(Revenue) is a weighted average of the betas of its components:

$$\beta_{\text{revenues}} = \beta_{\text{fixed costs}} \frac{\text{PV(Fixed Cost)}}{\text{PV(Revenue)}} + \beta_{\text{variable costs}} \frac{\text{PV(Var. Cost)}}{\text{PV(Revenue)}} + \beta_{\text{assets}} \frac{\text{PV(Asset)}}{\text{PV(Revenue)}}$$

- $\boldsymbol{\beta_{fixed\ costs}}$ should be zero since, whoever receives the fixed costs, receives a fixed stream of cash flows not correlated with market movements
- $\boldsymbol{\beta_{\text{variable costs}}}$ and $\boldsymbol{\beta_{\text{revenues}}}$ should be approximately the same, because they respond to the same underlying variable, which is the rate of output
- Therefore, we can substitutute $\boldsymbol{\beta_{\text{revenues}}}$ for $\boldsymbol{\beta_{\text{variable costs}}}$ and solve for the asset beta:

$$\beta_{\text{assets}} = \beta_{\text{revenues}} \frac{\text{PV(Revenue)} - \text{PV(Var. Cost)}}{\text{PV(Asset)}} = \beta_{\text{revenues}} \left[1 + \frac{\text{PV(Fixed Cost)}}{\text{PV(Asset)}}\right]$$

➔ The equation shows that assets with either high cyclicality or high operating leverage will have a high asset beta

3) *Other Sources of Risk*

➢ A project's value is determined by the expected value of future cash flows discounted at the risk-adjusted discount rate
- Therefore, if either risk-free rate or the market risk-premium changes, then *r* will change and also the project value
- For this reason, a project with very long-term cash flows is more exposed to changes in the discount rate than one with short-term cash flows

➔ Such a porject will therefore have a high beta, even though it may not have a high operating leverage or cyclicality

Diversifiable Risk and Fudge Factors

➢ When the risk is *diversifiable*, it does not increase the cost of capital for a project
- Hence, when measuring the present value of a project, the first step is to make unbiased forecasts for a project's cash flow
- Unbiased estimates for a project's cash flows incorporate all possible outcomes, including those specific to the project and those related to economywide events
- Then, the second step is to consider whether diversified investors would regard the project as more or less risky than the average project, and in this latter case only market risk matters

➢ *Fudge Factors* in discount rates are arbitrary mathematical terms inserted into a calculation in order to allow for errors:
- Fudge Factors are dangerous because they displace clear thinking about future cash flows
- Furthermore, in order to get the fudge factor, one should think through the possible cash flows, and one the forecasted cahs flows are correct, they are useless

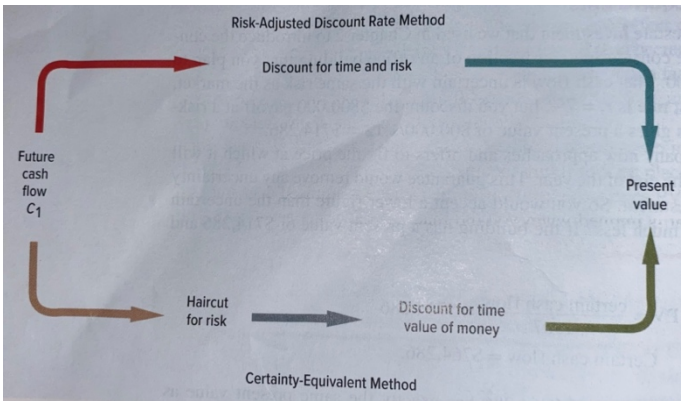
- Developing economies markets are very volatile, however much of this risk is diversifiable for investors in the US:
  - However, after considering the downside risks coming from international investments and giving them weight in the estimation of cash flows, one should NOT add a fudge factor to the disocunt rate
  - Indeed, analysts should analyze the beta of projects in developing countries and understand how they are correlated to the beta of their portfolio
  - In some cases, since foreign projects are less correlated to market events in the US, the market risk for US investors may be even lower

Certainty Equivalents

- In practical capital budgeting, a single risk-adjusted discount rate is used to discount all future expected cash flows:
  - However, this assumes that the project risk does not change over time, but remains constant throughout the whole project's life
  - Since this assumption cannot be strictly true, we can think about risk using certainty equivalents

- The *certainty equivalent* is the smallest certain payoff for which an investor would be willing to exchange the risky cash flow

- There are two methods in order to value a risky cash flow



  - The **Risk-Adjusted Discount Rate Method** discounts the future expected cash flow of a project using a risk-adjusted discount rate that adjusts for both time and risk

$$PV = \frac{C_t}{(1+r)^t}$$

  - The **Certainty-Equivalent Method** consists in finding the certainty equivalent (CEQ) cash flow and discounting it at the risk-free rate. Therefore, the method makes separate adjustments for risk and time

$$PV = \frac{C_t}{(1+r)^t} = \frac{CEQ}{(1+r_f)^t}$$

CHAPTER 16 – PAYOUT POLICY

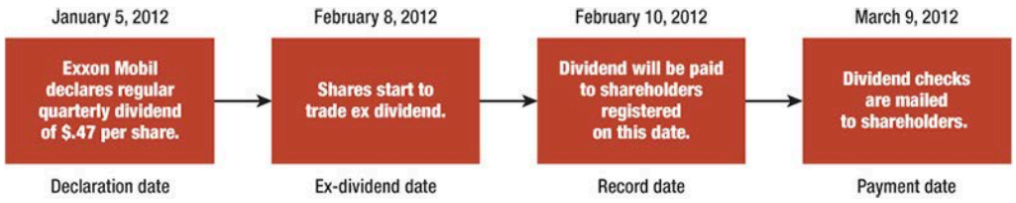
Facts about Payout

- Corporations pay out cash by either distributing dividends or by buying back some of their outstanding shares:

  - Repurchases were rare in the '80s, but recently the total value of repurchases has become similar to total dividends
  - Dividends have been much more stable than repurchases between 1980 and 2010
  - Cash-rich corporation sometimes undertake massive repurchase programs, but they often increase dividends at the same time

- Some companies are known as *nondividend payers*:
  - On the one hand, these can be companies that used to pay large dividends in the past, but then fell on hard times and had to cut back
  - On the other hand, these can be growth companies that have never paid a dividend and will not pay one in the foreseeable future

- A **cash dividend** is a pro-rata distribution to shareholders that is declared by a firm's board of directors and may or may not require the approval of shareholders
  - Since firm's shares trade constantly, and the firm's record of shareholders is not always up-to-date, corporations specify a particular day's list of shareholders who qualify to receive each dividend



  - If an investor buys the stock on the *ex-dividend date*, the date before the record date, the purchase will not be entered on the company's books before the record date, and he will not be entitled to the dividend
    ➔ Other things equal, a stock is worth less if an investor misses a dividend

- In some countries, companies are obliged to pay out a *minimum* proportion of their earnings:
  - Conversely, some restriction may be applied by lenders, who are concerned about the company's solvency
  - Most US companies pay a regular cash dividend each quarter, but occasionally this is implemented by a one-off special dividend

- Companies can also pay **stock dividends**, which is essentially similar to a stock split:
  - A stock dividend increases the number of shares outstanding, but does not affect the company's assets, profits, or total value
  - Both stock splits and stock dividends reduce value per share

- Instead of paying dividends to its stockholders, the firm can use the cash to repurchase stock, which is kept in the company's treasury and may be resold if the company's needs money

➔ There are four main methods to repurchase stocks:

1) *Buy share on the market*
  - Open market share repurchases represent about 95% of all repurchase transactions

2) *Tender offer to shareholders*
  - Firms offer to buy shares at a prespecified price during a short period of time
  - Repurchase prices are usually set at a premium (20% above market value)

3) *Dutch auction*
  - The firm lists different prices at which it is prepared to buy shares, and shareholders in turn indicate how many shares they are willing to sell at each price
  - Then, the firm pays the lowest price at which it can buy back its desired number of shares

4) *Private Negotiation*
  - The firm purchases shares directly from a specific shareholder
  - *Greenmail* is a rare phenomenon by which the firm avoids the threat of takeover and removal of its management by a major shareholder by buying out the shareholder, often at a large premium over the current market price

The Information Content of Dividends and Repurchases

- A survey carried out among corporate executives regarding payout policies underlined that:
  - Managers are reluctant to make dividend changes that may have to be reversed, and they could even borrow or issue new shares to maintain the dividend
  - Dividend changes follow shifts in the long-run, and transitory changes in earnings are unlikely to affect dividends
  - Managers focus more on changes rather than on absolute dividend levels

➔ Since investors know that managers are reluctant to reduce dividends and will not increase dividends unless they are confident that the payment can be maintained, an announcement of a dividend increase is good news for them

- This is why investors and financial managers refer to the *information content of dividends*
  - It implies that dividend increases predict future profitability
  - However, evidence also suggests that a dividend increase by a company already paying regular dividends does not predict increases in future earnings, but only predicts *safer earnings*
  - Indeed, managers maybe more propense to pay higher dividends if they expect that future earnings and cash flow will be less volatile than usual

➔ Keep in mind that investors do not get excited by the level of a company's dividend, but only by the change, which they view as an important indicator of sustainability of earnings

- Announcement of a **share repurchase program** is not a commitment to continue repurchases in later years
  - Therefore, such announcement is less strongly positive than the announcement of a dividend increase, even though a study has found that they resulted on average on a 2% abnormal price rise
  - Indeed, investors may applaud repurchases if they worry that managers would otherwise waste away the money on perks or unprofitable empire building
  - Stock repurchases may also be used to signal a manager's confidence in the future, especially if the stock is repurchased at a premium

The payout controversy

- Announcements of dividends and repurchases can convey information about management's confidence, and so affect the stock price

➔ Scholars have developed three different theories about the payout policies:

- *Rightists* are conservatives who argue that investors pay more for firms with generous, stable dividends
- *Middle-of-the-road party* claims that the choice between dividends and repurchases have no effect on value
- *Left party* argues that repurchases are better because dividends are taxed at higher effective rate than capital gains

Modigliani-Miller arguments

- The middle-of-the-party was founded in the '60s by Modigliani and Miller, when they published a proof that the dividend policy is irrelevant in a world without taxes, transaction costs, and other market imperfections

- Modigliani and Miller pointed out that one must consider the dividend policy only after holding the firm's assets, investments, and borrowing policy fixed
  - If the firm reduced capital investments to pay out cash dividends, the dividend on shareholder value is tangled up with the profitability of the foregone investment
  - If the firm decides to borrow to pay dividends, the effect of the dividend can't be separated from the effect of the additional borrowing

- Therefore, assuming that a firm keeps its investment policy and capital structure fixed:
  - If the firm wants to increase dividends, the extra cash can come only from selling shares
  - Alternatively, rather than increasing dividends and selling new shares, the firm can pay lower dividends. The cash saved will then be used to repurchase shares.

➔ Hence, any change in dividend payout must be offset by the sale or repurchase of shares

- When deciding whether to pay dividends or repurchase shares, managers must consider that a stock repurchase avoids the fall in stock price that would occur on the ex-dividend day if the amount spent on repurchases was paid in dividends:
  - Indeed, repurchases guarantee a stock price higher than if a dividend were paid
  - Furthermore, repurchases also reduce the number of shares outstanding, so future earnings per share are higher than if the same amount were paid in dividends

➔ Hence, if Modigliani and Miller are correct and payout policy does not affect value, then the choice between dividends and repurchases is merely tactical:
  - A company will decide to repurchase if it wants to retain the flexibility to cut back payout if valuable investment opportunity arise
  - On. the other hand, a company may decide to pay dividends if it wants to limit the temptation for careless spending

Stock Repurchases and DCF models of share price

- When a firm pays a dividend today, it also makes an implicit promise to continue paying dividends in later years, smoothing the dividends, and increasing them gradually as earnings increase

- Conversely, repurchases are not smoothed in the same way as dividends:
  - We should consider that a repurchase program reduces the number of outstanding shares and increases both earnings and dividends per share
- When repurchases play a key role, we have to valuation approaches:

1) Calculate the *market capitalization* by forecasting and discounting all the free cash flow paid out to shareholders

- Then, calculate price per share by dividing market capitalization by the number of shares currently outstanding

2) Calculate the present value of dividends per share, taking account of the increased growth rate of dividends per share caused by the declining number of shares resulting from repurchases
- This method becomes much more difficult to apply when repurchases are irregular or unpredictable

➢ Keep in mind that:
- Absent tax effects or other market frictions, today's market capitalization and share price are not affected by how future payout is split between dividends and repurchases
- Shifting payout to repurchases reduces current dividends but produces an offsetting increase in future earnings and dividends per share
- When valuing cash flow per share, it is double-counting to include both the forecasted dividends per share and cash received from purchases

Dividends and Share Issues

➢ Assuming that markets are efficient, and firms can sell their shares at a fair price, Modigliani-Miller theory implies that, holding the total payout constant, smaller dividends mean larger share repurchases
- Suppose that a company that has paid out any surplus cash wants to impress shareholders with a higher dividend
- Assuming borrowing fixed, it can only finance the dividend by issuing shares

➢ Therefore, the final effect will be a transfer of value from old shareholders to new one:
- New shareholders will get new shares which are worth less than before the dividend was announced
- Old shareholders will suffer a capital loss on their shares, which is however offset by the extra cash dividend received

➔ Hence, the firm that is issuing new shares to pay dividends is simply recycling cash:
- However, notice that investors do not need dividends to get hands on cash, and for this reason they will not be willing to pay a higher price for firms with high payouts
- For this reason, firms should not worry about paying low or no dividends.

The rightists

➢ The right-wing payout party points to real-world imperfections that could make high dividend payout ratios better than low ones
- One of the arguments is that there is a natural clientele for high-payout stocks because regular dividends relieve many of its shareholders of transactions costs and considerable inconvenience
- These investors might be willing to pay more for stocks of companies that paid out cash by dividends rather than repurchases

- However, they do not need to pay higher prices for firms that pay more dividends:
    - This is because corporations are free to adjust the supply of dividends to demand
    - Therefore, if they could increase the stock price by paying more dividends, they would have done so already
    - However, since investors who prefer cash dividends already have a wide-selection of dividend paying stocks, the supply of these stocks is already sufficient to satisfy these investors
    - Hence, additional firms do not have incentive to switch from repurchases to cash dividends

➔ If this is indeed the outcome, the Modigliani-Miller theory wins

- Perhaps, the most convincing argument supporting the rightist theory is that shareholders may require higher cash dividends because they do not trust the management:
    - If a firm has large Free-Cash-Flows and few profitable investment opportunities, investors may be worried about the management misusing the cash
    - Therefore, even though cash-cow corporations may be reluctant to let go of their cash, managers know that the stock price is likely to fall if investors sense that cash will be misused

Taxes and the radical left

- The left-wing creed is that, whenever dividends are taxed more heavily than capital gains, firms should pay the lowest cash dividend they can get away with
    - Then, the cash available for payout should be used to repurchase shares

- The leftist run into two problems:
    - The first problem is that firms actually pay cash dividends, while the best channel should always be repurchasing when cash is paid out
    - The second problem is that the difference between capital gain taxes and taxes on dividends has now disappeared
        - However, capital gain taxes have an advantage since they can be deferred until the gain is realized, therefore their present value is lower
        - On the other hand, taxes on dividends must be paid immediately
- Nonetheless, it is hard to deny that taxes do not have implications in investment decisions
    - Lightly taxed institutional investors have tended to hold high-yield stocks, while retail investors have preferred low-yield stocks
    - Furthermore, high-income individuals tend to prefer low-yield stocks, nonetheless taxes have not deterred them from holding dividend paying stocks
    - If investors are concerned about taxes, we might also expect that when the tax penalty on dividends is high, companies would think twice about increasing dividend payout

- It is safe to say that tax advantages of repurchases are one reason why they have grown so much in the US and other developed economies:
    - However, even though taxes are important, they cannot completely explain payout

- Indeed, if tax considerations were important, we would expect high dividend stocks to sell at lower prices and offer higher pretax return, but this is not the case

➢ In the US, shareholders' returns are taxed twice, both at the corporate level and in the hands of shareholders:
  - On the other hand, in some countries such as Australia and New Zealand, returns are not taxed twice
  - Australia adopts the *imputation system*, according to which shareholders are taxed on dividends, but they may deduct from this tax bill their share of the corporate tax that the company has paid

Payout Policy and the Life Cycle of the Firm

➢ According to the Modigliani-Miller analysis, payout is a residual and, therefore, firms should pay whatever cash is left over:
  - Hence, decisions about how much to pay out should change over the life-cycle of the firm

➢ *Young firms* usually have plenty of profitable investment opportunities:
  - During this time, it is efficient to retain and reinvest all the operating cash flow
  - Retaining cash avoids costs of issuing securities and minimizes shareholders' taxes
  - At this stage, investors are not worried about wasteful overinvestment because investment opportunities are good, and managers' compensation is tied to stock price

➢ *Mature firms* can invest in fewer positive-NPV projects:
  - At this stage, the firm begins to accumulate cash
  - Since investors start to worry about overinvestment or excessive perks, they start to pressure the management to pay out cash
  - Sooner or later the management complies to avoid stagnation in the stock price

➔ The payout may come as share repurchases, but initiating a regular cash dividend sends a stronger and reassuring message of financial discipline:
  - In this case, the commitment to financial discipline can outweigh the tax costs of dividends
  - Furthermore, regular dividends can be attractive to some types of investors that require a constant stream of cash

➢ In countries where corporations are more opaque and corporate governance less effective, payout can play a still more important role:
  - If financial information cannot be trusted, investors can look at the payout
  - If a firm reports good earnings and pays out a significant fraction of them, investors will more easily trust the management of the company.

CHAPTER 17 – DOES DEBT POLICY MATTER?

The Effect of Financial Leverage in a Competitive Tax-Free Economy

- Modigliani and Miller pointed out that managers should stop worrying about finding the right combination of debt and equity that maximizes the value of a firm:
  - Indeed, they insisted that, in a perfect market, any combination of securities is as good as another
  - Therefore, the value of a firm is *unaffected* by its choice of *capital structure*

- The *Law of Conservation of Value* states that the value of an asset is preserved, regardless of the nature of the claims against it:
  - The firm value is determined by *real assets*, and not by the proportions of debt and equity securities issued to buy the assets (**proposition 1**)

➔ Indeed, combining assets and splitting them up will not affect values as long as they do not affect investor's choices

- The assumption behind the concept that capital structure does not affect investors' choices is that both companies and individuals can borrow or lend at the same risk-free rate of interest:
  - As long as this is the case, individuals can undo the effect of any changes in the firm's capital structure

➔ In practice, corporate debt is not risk-free, but capital structure can be irrelevant even when debt is risky:
  - If a company borrows money, it does not guarantee repayment
  - It will repay the debt only if its assets are worth more than the debt obligation, and therefore shareholders have limited liability
  - Since many shareholders would like to borrow with limited liability, they might be prepared to pay a premium for levered stock if the supply of levered shares were insufficient
  - However, thousands of common stocks of levered firms trade on the market, thus it is unlikely that an issue of debt would induce investors to pay a premium for a share of stock

Financial Risk and Expected Return

- Leverage increases the expected stream of earnings per share but not the share price:
  - The reason is that the change in the expected stream is exactly offset by a change in the rate at which earnings are discounted

$$\text{Expected return on asset} = r_A = \frac{\text{Expected operating income}}{\text{market value of all securities}}$$

➔ Since in perfect markets the company's borrowing decision does not affect either the firm's operating income or total market value of its securities, the borrowing decision also does not affect the expected return on the firm's assets (r_A)

- Assume that an investor holds all of a company's debt and all of its equity:
  - Then, he will also be entitled to all the firm's operating income, and therefore his expected return on the portfolio is just the expected return on the company's assets (r_A)
  - The expected return on a portfolio is simply a weighted average of the expected returns on individual holdings, that is:

$$r_A = r_D \times \frac{D}{D+E} + r_E \times \frac{E}{D+E} = WACC$$

➔ By solving for r_E, we obtain:

$$r_E = r_A + (r_A - r_D) \times \frac{D}{E}$$

- This leads to **proposition 2** by Modigliani and Miller:
  - The expected return on the common stock of a levered firm increases in proportion to the debt-to-equity ratio (D/E), expressed in <u>market value</u>
  - The rate of increase on the expected return on the firm's equity depends on the spread between r_A and r_D

➔ When a firm is unlevered, equity investors require a rate of return of r_A
  - As the firm becomes levered, investors start to require a premium of $(r_A - r_D) \times \frac{D}{E}$ on the company's equity in order to compensate for the extra risk

Modigliani - Miller	
Proposition 1	Financial leverage has no effect on shareholders' wealth
Proposition 2	The rate of return shareholders expect to receive on their shares increases as the firm's debt-to-equity ratio increases

➔ Even if increased leverage increases expected returns, shareholders are indifferent to it because any increase in expected return is fully compensated by an increase in financial risk and therefore in the shareholders' required rate of return

Capital Structure and Beta

- Stockholders and debtholders both receive a share of the firm's cash flows and both bear part of the risk:
  - However bondholders bear much less risk than stockholders, indeed debt betas for large firms range between 0 and 0.2

➔ The firm's asset beta is equal to the beta of the portfolio of all firm's debt and equity:

$$\beta_A = \beta_{portfolio} = \beta_D \times \frac{D}{V} + \beta_E \times \frac{E}{V}$$

- After refinancing, the total risk of the firm's assets is unaffected, but both debt and equity are now more risky
- Assuming that the debt beta stays constant, we can work out the new equity beta:

$$\beta_E = \beta_A + (\beta_A - \beta_D) \times \frac{D}{V}$$

- The equation shows that financial leverage does not affect the risk of the expected return on the firm's assets, but it does push up the risk of common stock
- Indeed, shareholders demand a higher return due to the increase in financial risk

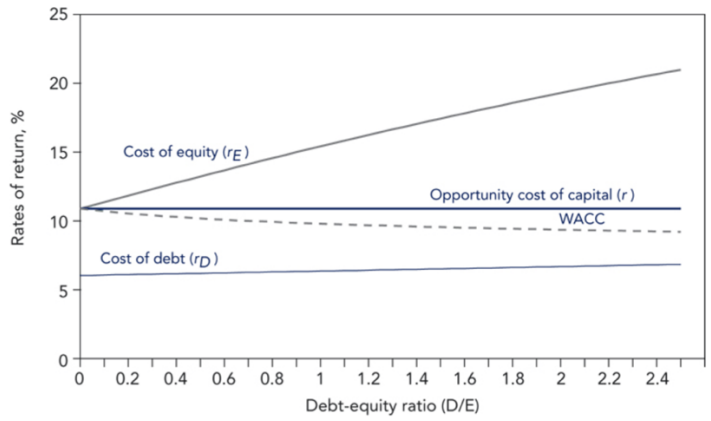
➢ Modigliani and Miller insisted that financial managers must be careful to the financial risk created by borrowing, especially when the borrowing is not in plain sight. Some examples are:
- Long-term leases are debt equivalent obligations that can hide debt
- Long-term contracts with suppliers can also be debts in disguise when prices and quantities are fixed
- Pension liabilities are massive off-balance-sheet, debt-equivalent obligations.

After-Tax WACC

➢ Modigliani and Miller pointed out that, when a firm changes its mix of debt and equity securities, the risk and expected return of these securities change, but the company's overall cost of capital does not change
- However, since in many countries the interest paid on a firm's borrowing can be deducted from taxable income, firms discount average-risk projects using the after-tax WACC:

$$\text{After Tax WACC} = (1 - T_C) \times r_D \times \frac{D}{A} + r_E \times \frac{E}{A}$$

➢ Modigliani and Miller Proposition 2 states that *in the absence of taxes*, the company cost of capital stays the same regardless of the amount of leverage
- However, if companies receive a tax shield on their interest payments, then the after-tax WACC declines as debt increases



CHAPTER 18 – HOW MUCH SHOULD A CORPORATION BORROW?

Corporate Taxes

- The fundamental advantage of debt-financing is that interest payments are tax-deductible expenses:
  - The only restriction was introduced in 2018, when the net amount of interest companies could deduct was limited to 30% of the EBITDA (30% of EBIT starting from 2022)

- Tax shields can be valuable assets for firms, assuming that their debt is fixed and permanent:
  - Indeed, if debt is fixed and permanent, a firm can look forward to a permanent stream of cash flows whose risk is likely to be less than the risk of the firm's operating assets
  - The tax shield depends on the corporate tax rate and on the ability of the firm to earn enough to cover interest payments

➔ Since the corporate tax rate has been pretty stable and the ability of a firm to its interest payments must be reasonably sure, otherwise it would not have borrowed, we should discount the interest tax shields at a relatively low rate
  - One common assumption is that the risk of tax shields is the same as that of the interest payments generating them

$$Interest\ Payment = Return\ on\ debt \times Amount\ Borrowed = r_D \times D$$

$$PV(tax\ shield) = \frac{corporate\ tax\ rate \times interest\ payment}{expected\ return\ on\ debt} = \frac{T_c r_D D}{r_D} = T_c D$$

  - The PV (Tax shield) is lower if the firm does not plan to borrow a permanent fixed amount, or does not have enough taxable income to use the interest tax shields

- Modigliani-Miller's Proposition 1 stated that the value of a firm did not depend on its capital structure:
  - However, if we consider corporate taxes together with debt and equity, the lower it is, the better shareholders are
  - Therefore, firms can increase their debt in order to reduce their tax bill and increase the cash flows to debt and equity investors

➔ Hence, as the firm increases debt, the *after-tax value* of a firm goes up by PV (Tax shield)

- Due to the benefits of the tax shield debt provides, Modigliani-Miller changed their equation for the enterprise value:

$$Value\ of\ firm = value\ if\ all\ equity\ financed + PV(tax\ shield)$$

  - In the special case of fixed, permanent debt, the equation becomes:

$$Value\ of\ firm = value\ if\ all\ equity\ financed + T_c D$$

➔ The formula states that the firm value and stockholders' wealth increases as Debt increases:
  - Hence, the optimal capital structure should be only debt financing
  - However, this conclusion is extreme, and Modigliani-Miller were not fanatical about it

- There are different reasons why our calculations overstate the value of interest tax shields:

1) Debt is actually **not** fixed and perpetual because a firm's ability to carry debt changes over time as profits and firm value fluctuate

2) Some firms face marginal tax rates of less than 21%

3) Interest tax shields cannot be used unless there will be future profits to shield, and no firm can be absolutely sure about that

4) The Tax Cuts and Jobs Act (2017) limits the amount of interest that can be deducted to 30% of taxable EBITDA (and 30% of taxable EBIT form 2022), and once a company breaches this limit, additional debt has no further tax advantage over equity

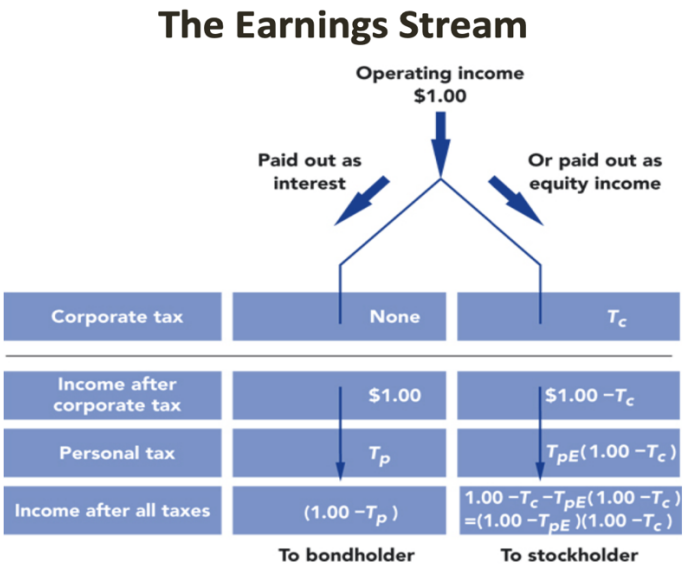
- Therefore, to further continue our discussion, we need to discuss:
  - Corporate and Personal taxation, which will uncover a tax disadvantage of corporate borrowing, offsetting the present value of the tax shield
  - Other costs related to the financial distress cause by borrowing

Corporate and Personal Taxes

- When personal taxes are introduced, the firm's objective is no longer to minimize the *corporate tax bill*:
  - Indeed, firms will try to minimize the present value of all taxes paid on corporate income
  - All taxes include also *personal taxes* paid by bondholders and shareholders

- Depending on the firm's capital structure, a dollar of operating income will accrue to investors either as debt interest or equity income:
  - T_p is the personal tax rate on interest
  - T_{pE} is the effective personal tax rate on equity income
  - T_{pE} can be well below T_p, depending on the mix of dividends and capital gains realized by shareholders

➔ The top marginal rate on dividends and capital gains is 20% in 2018, while the top rate on interest income is 37%
  - Furthermore, the capital gains taxes can be deferred until shares are sold, so the top effective capital gains rate is usually less than 20%



- The firm's objective should be to arrange its capital structure to maximize after-tax income:
  - Corporate borrowing is better if $(1 - T_p)$ is more than $(1 - T_{pE}) \times (1 - T_C)$, otherwise it is worse
  - The *relative tax advantage of debt over equity* will be:

$$Relative\ tax\ advantage\ of\ debt = \frac{(1 - T_p)}{(1 - T_{pE}) \times (1 - T_C)}$$

- This equation suggests two special cases worth discussing:

1) If debt and equity income are taxed at the same effective personal rate ($T_{pE} = T_C$), the relative advantage depends only on the *corporate rate*:

$$Relative\ tax\ advantage\ of\ debt = \frac{(1 - T_p)}{(1 - T_{pE}) \times (1 - T_C)} = \frac{1}{1 - T_C}$$

   - In this particular case, we can forget about personal taxes because the tax advantage of corporate borrowing is exactly as Modigliani-Miller calculated it
   - Indeed, their theory of debt and taxes requires only that debt and equity income are taxed at the same rate

2) The second special case occurs when corporate and personal taxes cancel to make debt policy irrelevant:

$$(1 - T_p) = (1 - T_{pE}) \times (1 - T_C)$$

   - This can happen only if T_C (corporate rate) is less than T_p(the personal tax rate) and if T_{pE} (the effective rate on equity income) is small

- Hence, regardless of the event, the basic decision rule will be to arrange the firm capital structure to make the tax expense the least possible.
   - However, this approach is not simple as it sounds
   - T_{pE} is not straightforward to measure because all possible tax brackets will be mixed together
   - T_p, the personal tax rate on interest, is not easy to measure because bondholders as well may be in different tax brackets

➔ To determine the net tax advantage of debt, companies would need to know the tax rates faced by marginal investors:
   - Marginal investors are investors who are equally happy to hold debt or equity
   - This makes it hard to put a precise figure on the tax benefit, but we can nevertheless provide a back-of-the-envelope calculation

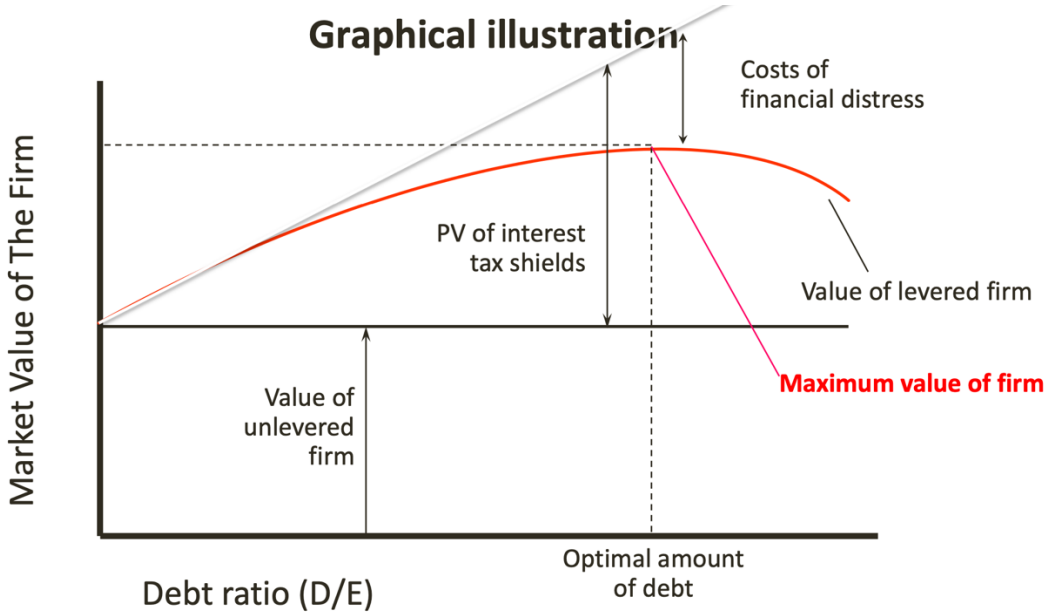
- Most financial managers believe that there is a moderate tax advantage to corporate borrowing, at least for companies that are reasonably sure they can use the corporate tax shields
   - For companies that cannot benefit from corporate tax shields, there is probably a moderate tax disadvantage
   - When we recognize personal taxes, the tax advantage to debt diminishes, but does not disappear
   - It still seems that financial managers have renounced to some easy tax savings because they recognized an offsetting disadvantage of increased borrowing

Costs of Financial Distress

- Financial Distress occurs when promises to creditors or broken or honored with difficulty
  - Financial distress can lead to bankruptcy
  - Since investors know that levered firms may fall into financial distress and worry about it, this worry is reflected in the current market value of the levered firm's securities:

$$Value\ of\ firm = value\ if\ all\ equity\ financed + PV(tax\ shield) - PV(costs\ of\ financial\ distress)$$

  - The cost of financial distress depends on the probability of distress and the magnitude of costs encountered if distress occurs



- The figure above shows how the trade-off between the tax benefits and the costs of distress could determine optimal capital structure:
  - The PV (tax shield) initially increases the firm's value as the firm borrows more
  - At low debt levels, the probability of financial distress should be low, and therefore the PV (cost of financial distress) is small and the tax advantage dominates
  - However, the probability of financial distress increases dramatically with additional borrowing, and eventually the cost of distress takes a substantial bite out of firm value
  - Furthermore, if the firm cannot be sure of profiting from the corporate tax-shield, or interest expense exceeds 30% of EBITDA or EBIT, the tax advantage of additional debt can eventually disappear

➔ The theoretical optimum is reached when the present value of tax savings due to further borrowing is offset by the present value of costs of distress (**Trade-off theory of capital structure**)

Bankruptcy Costs

- Corporate Bankruptcies occur when shareholders exercise their *right to default*:
  - This right is valuable because, when a firm gets in trouble, limited liability allows stockholders to walk away from it, leaving all its troubles to creditors
  - The former creditors become the new stockholders, and the old ones are left with nothing
  - However, triggering a bankruptcy is not free and shareholders may face high costs

➔ Hence, bankruptcy is merely a legal mechanism for allowing creditors to take over when the decline in the value of assets triggers a default, it is not the cause of the decline in the assets' value

- *Bankruptcy Costs* are the costs related to the implementation of the bankruptcy mechanism:
  - If we compare two firms, one with limited and the other one with unlimited liability, the combined payoffs to bondholders and stockholders is the same in the company with unlimited liability as in the one with limited liability
  - Thus, the overall market value of the two firms must be identical

➔ Of course, the stock price for the limited liability firm must be higher than for the unlimited liability one
➔ The debt for the limited liability company must be correspondingly less than for the unlimited one

- When leverage increases, the present value of the cost of financial distress increases, and the stick price declines:
  - The higher the borrowing, the higher the probability of default and the value of the lawyer's claim
  - Since the cost of bankruptcy is born by stockholders, creditors foresee that shareholders will pay them if bankruptcy occurs and do require compensation in advance in the form of higher payoffs when the firm does not default
  - Hence, this reduces the possible payoffs to stockholders and reduces the present market value of their shares

- The **direct cost of bankruptcy** are the costs directly related to the bankruptcy mechanisms:
  - These include legal, accounting, and other professional fees
  - However, a bankruptcy also involves many **indirect costs** which are large, but impossible to measure
  - The best evidence of indirect bankruptcy costs is the reluctance of creditors to force bankruptcy and seize the assets, since they do not want to incur large indirect costs

- As long as a firm can scrape up enough cash to pay the interest on its debt, it can postpone bankruptcy and eventually recover, pay off its debt, and escape bankruptcy:
    - However, threats of financial distress can be costly for the firm
    - Customers worry about resale value and the availability of service and replacement parts
    - Suppliers may be disinclined to have a business relationship with a distressed firm and may require cash in advance
    - Potential employees are unwilling to sign on and existing staff may try to get out to competitors

➔ Furthermore, high debt, and thus high financial risk, also appears to be reducing the firms' appetite for business risk, and make them less incline to pursue business opportunities or restructuring

Debt and Incentives

- When a firm is in trouble, both shareholders and bondholders have incentive to rescue it, but their interests may be in conflict:
    - Conflicting interests may be costly when they get in the way of proper operating, investment, and financing decisions
    - Stockholders are indeed tempted to forsake the usual objective of maximizing the overall market value of the firm and to pursue narrower self-interest instead, by playing games at the expense of creditors

1) *Risk Shifting*

- Assuming that a company is in financial distress because the book value of its liabilities is higher than the market value of its assets:
    - In such cases, stockholders of levered firms gain when business risk increases
    - Therefore, financial managers will act strictly in their shareholders' interests and against the interests of creditors by favoring risky projects over safe ones
    - Indeed, they may even take negative NPV projects, since the temptation to play is strongest when the odds of default are high

2) *Refusing to Contribute Equity Capital*

- Assuming a constant business risk, any increase in firm value is shared among bondholders and shareholders:
    - Therefore, the value of any investment opportunity to the firm's stockholders is reduced because project benefits must be shared with bondholders
    - Thus, it may not be in the stockholders' best interest to contribute fresh equity capital even if that means forgoing positive-NPV investment opportunities
    - This problem theoretically affects all levered firms, but is accentuate during financial distress

➔ The greater the probability of default, the more bondholders have to gain from investments that increase firm value

3) *Cash In and Run*

- Shareholders may be reluctant to put money into a firm in financial distress, but they will happily take money out:
    - For instance, they will be willing to pay large cash dividends
    - These policies shrink the market value of the firm by less than the amount of the dividend paid because the decline in firm value is shared with creditors

4) *Playing for Time*

- When a firm is in financial distress, creditors would like to salvage what they can by forcing the firm to settle up:
    - Naturally, stockholders want to delay this as long as they can because they want the current operating performance to look better
    - They can do so with accounting changes to hide the true extent of trouble, by encouraging false hopes of spontaneous recovery, or by cutting corners on maintenance, R&D and so on

5) *Bait and Switch*

- This game is not always play during financial distress, but can quickly get a firm into distress
    - Managers start with a conservative policy, issuing a limited amount of relatively safe debt
    - Then, they switch and start to issue a lot more debt, which makes all of the firm's debt riskier
    - The increase in riskiness will impose a capital loss on old bondholders, which translates in a gain for shareholders

Cost of Games

- These games lead to bad investment and operating decisions by firms:
    - These poor decisions are known as the *agency cost of borrowing*
    - The more a firm borrows, the higher the temptation to play these games
    - Hence, the increase odds of poor decisions in the future encourage investors to mark down the present market value of the firm

➔ Hence, it is ultimately in the shareholders best interest avoiding playing these games

- The easiest way to do this is to limit borrowings to level at which the firm's debt is safe
- Banks and other corporate lenders will understand that these games may be played, and will therefore ration the amount they are willing to lend, or impose restrictive covenants (e.g., covenants on payout policies)

- Since banks understand that they will incur monitoring costs to ensure that firms are not behaving opportunistically, they will ultimately charge them higher interest rates, which directly affect shareholders pockets
    - However, contracts are always *incomplete* because they cannot encompass every scenario

- Costs of distress vary widely according to the Type of Asset it affects:
  - Some assets, like real estate, can pass through bankruptcy and real estate largely untouched
  - Other assets, such as the intangible assets linked to the health of a firm as a going concern, may be considerably diminished

➔ Hence, not only borrowing is likely to bring trouble to firms, but if distress comes, value may be lost

Trade-Off theory of Capital Structure

- The *trade-off theory* of capital structure recognizes that target debt ratios may vary from firm to firm:
  - Companies with safe, tangible assets and plenty of taxable income to shield should have high target ratios
  - Unprofitable companies with risky, intangible assets should primarily rely on equity financing

➔ If there were no costs of adjusting capital structure, then each firm should be at its target debt-to-equity ratio
  - However, adjusting to the optimum is actually costly
  - Furthermore, firms cannot immediately offset the random events that bump them away from their capital structure targets
  - Hence, we should see random differences in actual debt ratios among firms having the same target debt ratio

- This theory is more comforting than the Modigliani-Miller theory since it avoids extreme predictions and rationalizes moderate debt ratios
  - Indeed, if we ask financial managers whether they have target debt ratios, they will usually say "yes", even though they mostly target a capital structure to maintain a debt rating

- The theory is useful at explaining why different firms have different capital structures
  - However, the theory does <u>not</u> explain why some of the most successful companies thrive with no or little debt, even though debt could provide large tax shields
  - The main reason behind this is that large companies are unlikely to make major shifts in the capital structure just because of taxes, and it is hard to detect the value of interest tax shields in firms' market values

CHAPTER 19 – FINANCING AND VALUATION

The After-Tax WACC

- Under Modigliani-Miller hypotheses, financing decisions have no impact whatsoever on the value of a business:
  - However, in actual capital budgeting decisions, investment and financing decisions interact and cannot be wholly separated
  - The main reason behind this is that financing and investment decisions interact through *taxes*, because interest expense is a tax-deductible expense
  - Therefore, firms usually compute the After-Tax WACC in order to take into account the tax shield provided by debt:

$$WACC = r_D(1 - T_c)\frac{D}{V} + r_E\frac{E}{V}$$

➔ This formula gives the right discount rate for an **average project** undertaken by the firm

- The WACC is based on the firm's current characteristics, but managers use it to discount *future cash flows*:
  - This can work as long as the firm's debt-to-equity ratio and business risk remain constant
  - However, in case of a change in either business risk or the D/E ratio, using the WACC as a discount rate is just *approximately correct*

- When using the WACC, keep in mind that:

1) The WACC formula works only for projects that are *identical* to the firm

2) The immediate source of funds for a project has no necessary connection with the *hurdle rate* of the project
   - What really matters is the project's overall contribution to the firm's borrowing power
   - For instance, if a firm borrows 90% of the cost of a project, it is actually borrowing against all of its existing assets
   - Hence, any advantage of financing the project with more debt than normal should be attributed to the firm's old projects, not the new one

3) Increasing the debt financing does not proportionally reduce the firm's cost of capital:
   - Indeed, as the firm takes on more debt, it becomes riskier
   - Hence, an increase in debt will necessarily increase the cost of equity financing, as shareholders will require a risk-premium

Valuing Businesses

- When valuing an entire business instead of a single project, analysts must treat the company as it were a big business project:
  - Hence, they need to find the company's Free Cash Flows and discount back to Present Value

1) If you discount using the WACC, cash flows must be projected just as you would with capital investment projects:
   - Interests shall not be deducted
   - Taxes should be computed as if the company was all-equity-financed, because the After-Tax WACC already considers the tax-shield

2) The *going-concern* assumption assumes that businesses can potentially run forever, however this does not mean that Cash Flows should be forecasted infinitely:
   - Financial Managers usually forecast to a medium-term horizon and add a *terminal value* to the cash flows in the horizon year
   - The *terminal value* is the PV at the horizon of all the future cash flows, however estimating it requires for careful attention because it often accounts for the majority of the company's value

3) Discounting at WACC values the *assets and operations* of the company:
   - If the object is to value the company's equity, the value of the company's outstanding debt must be subtracted from the enterprise value

- **Free Cash Flow** is the amount of cash that the firm can pay out to investors after making all investments necessary for growth:
  - FCF are calculated as the firm was totally equity-financed
  - FCF differ from net income in several ways, because they do not include interest expenses, depreciation expenses, but include CAPEX
  - FCF can be negative for rapidly growing firms, even if the firm are profitable, since investments exceed the Cash Flow from Operations
  - However, negative FCFs are normally temporary, and usually turn positive as growth slows down and the payoffs from prior investments start to roll-in

$$FCF = Profit\ after\ Tax + Depreciation - Investment\ in\ fixed\ assets - Investment\ in\ Working\ Capital$$

- The **Horizon Value** can be estimated in several ways, however we will use the Constant Growth DCF formula to do it:

$$PV_{Horizon} = \frac{FCF_{H+1}}{WACC - g}$$

- In order to value businesses, financial managers can also look at the *market-to-book ratio* for comparable firms, and calculate how the firm would be worth if sold at a similar ratio

- Furthermore, it may also be that a business is worth more dead rather than alive:
  - For this reason, it is useful to calculate the company's *liquidation value* and check if it exceeds its value as a going concern
  - Sometimes, financial managers find new or unused assets which may be worth much more if sold to someone else. Such assets are valued at their likely sale price, and the rest of the business is value without them

Flow-to-equity method

- If we are interested in finding out the value of a firm's equity, we can use the Flow-to-equity method:
  - The method consists in discounting cash flows to equity after interest and taxes at the cost of equity capital
  - Assuming that the company's debt to equity ratio is constant over time, the flow-to-equity method gives the same answer as discounting total cash flows at the WACC and then subtracting the value of debt

Using the WACC in Practice

- Some businesses may have more than only debt and equity as sources of financing:
  - For instance, they may also use preferred stock as a form of financing
  - In this case, the weight for each element is proportional to its market value

$$WACC = r_D(1 - T_c)\frac{D}{V} + r_p\frac{P}{V} + r_E\frac{E}{V}$$

- **Short-term debt** is often excluded when calculating the WACC, and only long-term financing is considered:
  - Even though, in principle, zeroing out short-term debt is incorrect, it can be reasonable to do it
  - Indeed, if the debt is only temporary, seasonal, or incidental financing, it can reasonably be excluded from the WACC calculation

- **Current Liabilities** are usually *netted out* by subtracting them from current assets
  - The difference is entered into the Net working capital on the asset side of the balance sheet
  - When Net working capital is treated as an asset, increases in Net Working Capital will be reported as a cash outflow, while decreases as an inflow
  - The sum of long-term financing on the right side of the Balance Sheet is called *Total Capitalization*

- Since Current Liabilities include short-term debt, when they are netted out against current assets, we exclude the cost of short-term debt from the WACC:
  - We have previously stated that this is a reasonable assumption when the short-term debt is temporary, seasonal, or incidental financing
  - However, if the short-term debt is an important, permanent source of financing, it should be shown explicitly on the liabilities side of the balance sheet
  - Indeed, the interest cost of short-term debt will be one element of the WACC

- Estimating the WACC with only debt and equity financing is rather easy, since r_E can be calculated using stock market returns, D and E are taken from the Balance sheet, and r_D can be directly observed:
    - However, estimating the required rate of return on other security types, such as Convertible Debt or Junk Bonds, can be troublesome
    - Even though it is very hard to estimate the expected rate of return on junk bonds, for most debt, the odds of default are small, and therefore the promised and expected rate of return are close, and thus the promised rate can be used as an approximation in calculating the WACC

- The **Industry WACC** for a particular company's investments assumes that the company and the industry have approximately the same business risk:
    - However, Industry WACCs must be adjusted if the industry-average debt ratios differ from the target debt ratio for the project to be evaluated

- The WACC formula considers the *marginal tax rate*
    - The *marginal tax rate* is the amount of cash taxes paid as a percentage of each dollar of additional income generated by a capital-investment project
    - However, it is not always a very precise measure, since often corporations can exploit loopholes to gain tax advantages

- Sometimes interest tax shields from new debt cannot be captured immediately because the company is either suffering losses overall, or its total interest payments exceed 30% of EBITDA:
    - In such cases, the company should not change its WACC, especially if the losses are temporary
    - Indeed, tax losses and nondeductible interest can be carried forward and used to shield future income
    - However, if the wait to use interest tax shields from additional borrowing is long enough, it may be best to use the APV method

Adjusting the WACC when Debt Ratios and Business Risks differ

- The WACC formula assumes that the project or business to be valued will be financed in the same debt/equity proportion as the company or industry as a whole:
    - However, there may be cases in which this is not true
    - For instance, if a firm reduces its debt/equity ratio, all the inputs in the WACC formula will vary, also because the cost of equity will be lower due to lower risk
    - On the other hand, when the debt/equity ratio increases, the cost of equity increases but the WACC declines due to the tax shields on debt interest payments
    - If there were no corporate taxes, the WACC would be constant and equal to the opportunity cost of capital at all debt ratios

- Steps to adjust the WACC:

1) **Unlever the WACC** by computing the WACC and the cost of equity at zero debt:

$$Opportunity\ cost\ of\ capital = r = r_D \frac{D}{V} + r_E \frac{E}{V}$$

   - The formula comes from MM Proposition 1
   - If taxes are left out, the WACC equals the opportunity cost of capital and is independent of leverage

2) **Estimate r_D**, the cost of debt, at the new debt ratio, and then calculate the new cost of equity:

$$r_E = r + (r - r_D)\frac{D}{E}$$

   - The formula comes from MM Proposition 2

3) Recalculate the WACC at the new financing weights

- The three steps procedure above consists in unlevering and then relevering the cost of equity:
   - Similarly, some financial managers find it useful to unlever and then relever the equity beta
   - Given the beta of equity at the new debt ratio, the cost of equity can be calculated from the CAPM

➔ Then, we are able to compute the WACC at the new debt ratio:

$$r_E = r_f + \beta_E(r_m - r_f)$$

1) The **unlevered beta** is the beta of the cost of equity if the company had zero debt:

$$\beta_A = \beta_D \frac{D}{V} + \beta_E \frac{E}{V}$$

   - The equation states that the beta of a firm's assets is equal to the beta of a portfolio of all of the firm's outstanding debt and equity securities

2) **Estimate** the **betas** of the debt and equity at the new debt ratio:

$$\beta_E = \beta_A + (\beta_A - \beta_D)\frac{D}{E}$$

   - The formula for relevering the beta closely resembles MM Proposition 2, apart from the Betas that substitute the rates of return

3) Recalculate the cost of equity and the WACC at the new financing weights

- **Rebalancing** is one of the fundamental assumptions to calculate the WACC, and to unlever and relever expected returns:
    - Indeed, calculating the WACC for a company at its existing capital structure requires that the capital structure won's change
    - Hence, the company must rebalance its capital structure to maintain the same market-value/debt ratio for the future

- Rebalancing means that, if the market value of the firm increases, the firm will increase its borrowing in order to keep its market-value/debt ratio constant:
    - The proceeds of the additional debt will be used then to finance new investments, or could be paid out
    - Similarly, if the market value falls, the firm will rebalance by paying down debt proportionally

➔ Of course, real companies do not rebalance capital structure in such a mechanical way, however if significant changes in capital structure occur, the WACC formula will not work anymore:
    - In such cases, turning to the APV is the best method

Modigliani Miller formula

- If the firm does not intend to rebalance, the only general approach is APV:
    - However, financial managers may also resort to other discount rate formulas such as the Modigliani Miller formula

➔ MM considered a company or project generating a stable, perpetual stream of cash flows financed with fixed, perpetual debt

$$r_{MM} = r\left(1 - T_c \frac{D}{V}\right)$$

    - In order to unlever this formula, it is sufficient to set the debt-capacity parameter equal to zero

- The MM formula is used in practice, but only in the special case where there is a constant, perpetual stream of cash flows and fixed, perpetual debt:
    - However, the formula is not a bad approximation for projects that are not perpetual as long as debt is issued in fixed amount

➔ Nonetheless, most financial managers use the after-tax WACC instead of the fixed-debt model, since the former assumes a constant market-value/debt ratio and therefore assumes rebalancing
    - Using the after-tax WACC makes sense because the debt capacity of a firm or project must depend on its future value, which will of course fluctuate
    - At the same time, it is worth noticing that most financial managers don't care about the market-value/debt ratio fluctuating within a reasonable range of financial leverage

***Adjusted Present Value* (*APV*)**

- The APV is used in order to make a series of present value calculations, instead of capturing the effects of financing by adjusting the discount rate:

$$APV = base\ case\ NPV + Sum\ of\ PVs\ of\ financing\ side\ effects$$

  - The first calculation establishes a base-case value for the project or firm, and calculates its value as a separate, all-equity financed venture
    ➔ The discount rate will be simply the opportunity cost of capital

  - Once the base-case value is set, then each financing side effect is traced out, and the PV of its cost or benefit to the firm is calculated

  - Lastly, all the PVs are added together to estimate the project's total contribution to the value of the firm

- The most important side effect is the interest tax shield on the debt supported by the project, which enters the equation with a plus sign
  - Other possible side effects are the issue costs of securities (minus sign)

➔ APV gives financial managers an explicit view of the factors that are adding or subtracting value:
  - It is extremely useful because the model does not assume that debt must be fixed at a constant portion of value

- APV can be used to value entire businesses as well, and it is particularly useful when the debt is tied to book value or has to be repaid on a fixed schedule

- A situation in which it is useful to use the APV is with LBOs:
  - LBOs are takeovers which are heavily debt financed
  - However, the new debt is not intended to be permanent, indeed LBOs business plans call for generating extra cash to pay down the debt
  - Therefore, in this case, using the WACC is incorrect because the debt ratio will not be constant

➔ APV is the right valuation method, as it first computes the enterprise value as if the firm was completely equity-financed
  - Then, the tax shields are valued separately and added to the all-equity value
  - Any other financing side effect is also added

- APV works just fine when there are limits on interest deductions, such as the 30% of EBITDA limitation:
    - If a firm is profitable and pays taxes, the future interest tax shields generated by a new investment project are proportional to its future EBITDA
    - The financial manager should forecast EBITDA and the associated tax shields, and discount it at a rate depending on the risk of EBITDA

➔ In this case, the APV formula is always the same, however the PV of interest tax shield will be strictly tied to the project's forecasted EBITDA

- Projects that generate a large EBITDA will be valuable to firms limited by the 30% constraint, since the higher the EBITDA, the less likely it is that the constraint will be touched, and therefore the firms unlock the tax shields

- However, if it is forecasted that the project will temporarily meet the 30% constraint, then the unused tax shields are not lost but can be carried forward indefinitely

- APV is most useful when financing side effects are numerous and important, and this is the case for International Projects:
    - These projects are typically characterized by very high debt ratios at the beginning, with most of a project's early cash flows used to service debt
    - APV is useful because it can help find the PV of an international project considering contracts with suppliers or customers, restrictions of local governments on investments or disinvestments, and debt financing at favorable rates

➔ The PV of a project can therefore be found by summing and subtracting the PVs of the collateral effects of financing, regulations, and agreements on the overall project